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NATIONAL DAM SAFETY PROGRAM. BUSCH WILDLIFE AREA LAKE NUMBER 35--ETC(U)
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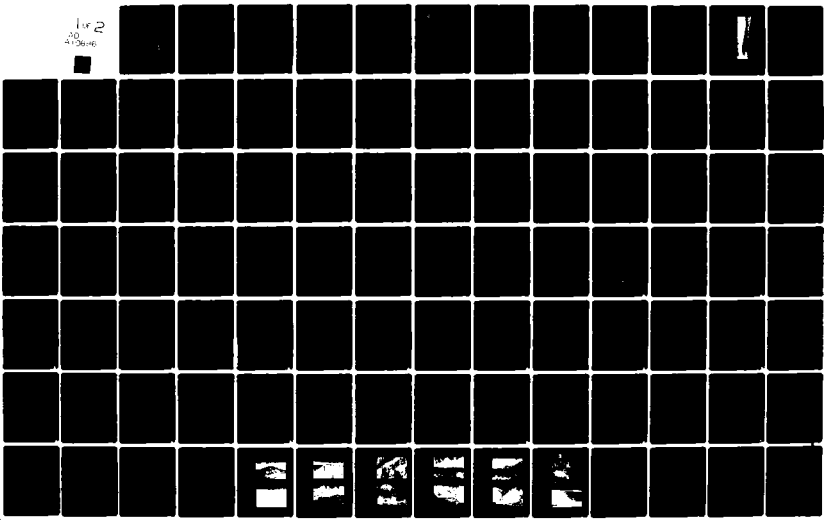

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MISSISSIPPI·KASKASKIA·ST. LOUIS BASIN

BUSCH WILDLIFE AREA LAKE NO. 35 DAM
ST. CHARLES COUNTY, MISSOURI
MO. 10092

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

United States Army
Corps of Engineers
Serving the Army
Serving the Nation

St. Louis District

PREPARED BY: U. S. ARMY ENGINEER DISTRICT, ST. LOUIS

FOR: STATE OF MISSOURI

NOVEMBER 1979

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National Dam Safety Program
Busch Wildlife Area Lake No. 35 Dam (MO 10092)
St. Charles County, Missouri

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Dam Safety, Lake, Dam Inspection, Private Dams

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.

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DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

IN REPLY REFER TO

SUBJECT: Busch Wildlife Area Lake No. 35 Dam (Mo. 10092) Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Busch Wildlife Area Lake No. 35 Dam (Mo. 10092).

It was prepared under the National Program of Inspection of Non-Federal Dams.

This dam has been classified as unsafe, non-emergency by the St. Louis District as a result of the application of the following criteria:

1) Spillway will not pass 50 percent of the Probable Maximum Flood
2) Overtopping could result in dam failure
3) Dam failure significantly increases the hazard to loss of life downstream

SUBMITTED BY: SIGNED — 26 DEC 1979
Chief, Engineering Division — Date

APPROVED BY: SIGNED — 28 DEC 1979
Colonel, CE, District Engineer — Date

BUSCH WILDLIFE AREA LAKE NO. 35 DAM

ST. CHARLES COUNTY, MISSOURI

MISSOURI INVENTORY NO. 10092

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

PREPARED BY

CONSOER, TOWNSEND AND ASSOCIATES, LTD.

ST. LOUIS, MISSOURI

AND

ENGINEERING CONSULTANTS, INC.

ENGLEWOOD, COLORADO

A JOINT VENTURE

UNDER DIRECTION OF

ST. LOUIS DISTRICT, CORPS OF ENGINEERS

FOR

GOVERNOR OF MISSOURI

NOVEMBER 1979

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Busch Wildlife Area Lake No. 35 Dam, Missouri Inv. No. 10092
State Located:	Missouri
County Located:	St. Charles
Stream:	Schote Creek
Date of Inspection:	June 15, 1979

Assessment of General Condition

Busch Wildlife Area Lake No. 35 Dam was inspected by the engineering firms of Consoer, Townsend and Associates LTD., and Engineering Consultants, Inc. (A Joint Venture) of St. Louis, Missouri using the "Recommended Guidelines for Safety Inspection of Dams". These guidelines were developed by the Chief of Engineers, U.S. Army, Washington, D.C., with the help of Federal and State agencies, professional engineering organizations, and private engineers. The resulting guidelines are considered to represent a consensus of the engineering profession.

The overall structural condition of the dam appears to be good. The dam does not exhibit signs of structural instability, except for possibly the longitudinal and transverse cracks observed on the crest of the upstream berm which should be investigated. The dam appears adequately maintained.

Based on the criteria in the guidelines, the dam is in the high hazard potential classification, which means that loss of life and appreciable property loss could occur in the event of failure of the dam. The estimated damage zone extends about 1 1/2 miles downstream of the dam. Within the damage zone are seven trailers and a bridge under U.S. Highway 40 which may be subjected to flooding, with possible damage and/or destruction, and possible loss of life. The Busch Wildlife Area Lake No. 35 Dam is in the intermediate size classification since its storage capacity is more than 1,000 acre-feet, but less than 50,000 acre-feet.

Our inspection and evaluation indicates that the spillway of Busch Wildlife Area Lake No. 35 Dam does not meet the criteria set forth in the guidelines for a dam having the above size and hazard potential. Busch Wildlife Area Lake No. 35 Dam being an intermediate size dam, with a high hazard potential, is required by the guidelines to pass the Probable Maximum Flood without overtopping. It was determined that the reservoir/spillway system can accommodate 31 percent of the Probable Maximum Flood without overtopping the dam. Our evaluation indicates that the reservoir/spillway system will accommodate the 100-year flood without overtopping.

The Probable Maximum Flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in the region. The 100-year flood is defined as a flood having a one percent chance of being equalled or exceeded during any given year.

Other deficiencies noted by the inspection team were: longitudinal and transverse cracks observed on the crest of the upstream berm; severe erosion of the upstream berm; obstruction of the spillway weir; erosion of the side slopes of the spillway

discharge channel; the low level drain did not appear to be in working condition; the seepage observed in the spillway discharge channel; the trees and debris in the downstream channel; a lack of periodic inspection by a qualified engineer and a lack of a maintenance schedule. The absence of seepage and stability analyses on record is also a deficiency.

It is recommended that the owner take action to correct or control the deficiencies described above.

Walter G. Shifrin, P.E.

Overview of Busch Wildlife Area Lake No. 35 Dam

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

BUSCH WILDLIFE AREA LAKE NO. 35 DAM, I.D. NO. 10092

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PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

Busch Wildlife Area Lake No. 35 Dam, Missouri Inv. No. 10092

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

The Dam Inspection Act, Public Law 92-367 of August, 1972, authorizes the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspections. Inspection for the Busch Wildlife Area Lake No. 35 Dam was carried out under Contract DACW 43-79-C-0075 between the Department of the Army, St. Louis District, Corps of Engineers, and the engineering firms of Consoer, Townsend & Associates Ltd., and Engineering Consultants, Inc. (A Joint Venture), of St. Louis, Missouri.

b. Purpose of Inspection

The visual inspection of the Busch Wildlife Area Lake No. 35 Dam was made on June 15, 1979. The purpose of the inspection was to make a general assessment as to the structural integrity and operational adequacy of the dam embankment and its appurtenant structures.

c. Scope of Report

This report summarizes available pertinent data relating to the project; presents a summary of visual observations made during the field inspection; presents an assessment of hydrologic and hydraulic conditions at the site; presents an assessment as to the structural adequacy of the various project features; and assesses the general condition of the dam with respect to safety.

Subsurface investigations, laboratory testing, and detailed analyses were not within the scope of this study. The conclusions drawn herein, therefore, are based on the presence of, or absence of, obvious signs of distress. No warranty as to the absolute safety of the project features is implied by the conclusions presented in this report.

It should be noted that reference in this report to left or right abutments is as viewed looking downstream. Where left abutment or left side of the dam is used in this report, this also refers to northwest abutment or side, and right to the southeast abutment or side.

d. Evaluation Criteria

Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams", Appendix D. These guidelines were developed with the help of several Federal agencies and many State agencies, professional engineering organizations, and private engineers.

1.2 Description of the Project

a. Description of Dam and Appurtenances

The dam consists of a homogenous earthfill embankment between an earth abutment on the left side and a rock abutment on the right side. The crest is 14 feet wide and 930 feet long as shown on available drawings. The crest elevation is 563.5 feet above MSL. The maximum height of the embankment is 35 feet.

The upstream slope was constructed with either a 1V to 3H or a 1V to 2.5H slope from the crest to elevation 558.0 according to the available drawings. From field measurements, the slope was found to be 1V to 3.75H. At elevation 558.0, a 20-foot wide berm was constructed. From elevation 558.0 to the streambed elevation, the slope is either 1V to 3H or 1V to 2.5H according to the available drawings. The upstream slope has riprap protection on it below elevation 558.0 which was not shown on the design drawings. The riprap ranges in size from 2 inches to 24 inches.

The downstream slope is constructed with a 1V to 2.5H slope from the crest to elevation 540.0. At elevation 540.0, a 20-foot wide berm is constructed. From elevation 540.0 to the original ground, the slope is 1V to 2.5H.

The dam is located near the southern edge of the Dissected Till Plains Section of the Central Lowlands Province (Fenneman, N.M., "Physiographic of Eastern United States", 1946). In the area of the dam site, overlaying the glacial till, is a considerable amount of loess. However, much of the surficial material in the vicinity of the dam has been eroded. The area is characterized by gently rolling hills.

Regionally, the rocks are dipping gently about 40 feet per mile to the northeast off of the Ozark Uplift to the south. The rocks in the area range in age from Ordivician to Mississippian.

According to the design drawings, the spillway weir, the spillway channels and the right abutment are founded on bedrock. Approximately the right one third of the dam is founded on the bedrock and the rest of dam is founded on the surficial material overlaying the bedrock, according to the design drawings.

A cutoff trench, with side slopes of 1H to 1V, and a base width of 10 feet, was excavated parallel to the dam axis across the entire dam according to the available drawings. From near the right abutment toward the left abutment for approximately 135 feet, the trench was excavated to or into the rock foundation.

There is only one spillway for the Busch Wildlife Area Lake No. 35 Reservoir. The spillway is cut into the right abutment. The spillway consists of a straight drop concrete rectangular weir with a crest length of 50 feet. From the crest of the weir, there is a 3.5 foot vertical drop to a 3.5 foot wide concrete apron which abuts the rock in the discharge channel. The elevation of the crest of the weir is 557 feet above MSL. The spillway channels consist of an approach channel and a discharge channel. The approach channel, which has a 50-foot wide bottom and is approximately 100 feet in length, is excavated to rock. The side slopes of the approach channels are 1V to 3H. The discharge channel has a 50-foot wide bottom and is approximately 270 feet in length and is excavated into the rock. The side slopes of the discharge channel vary from near vertical to 1V to 3H.

A low level outlet drain pipe was provided for the reservoir. The intake is at elevation 536.0 and the discharge is at elevation 531.0 according to the available drawings. The pipe is a 12-inch inside diameter C.I.P. located approximately 335 feet from the right abutment. The outlet is controlled by a gate valve which is located 40 feet upstream from the outlet of the pipe.

b. Location

Busch Wildlife Area Lake No. 35 Dam is located on Schote Creek which flows northeasterly from the dam for approximately 2.5 miles into Dardenne Creek, St. Charles County, Missouri (Plate 1). The nearest downstream community is a trailer park which is approximately 0.7 miles downstream of the dam. The dam and reservoir are shown on the Weldon Springs Quadrangle Sheet (7.5 minute series) in Township 46 North, Range 2 East (Plate 1, Appendix B). The dam was located by the U.S. Survey No. 1669 as being 10,930 feet northwest and 53 feet southwest from the southwest corner of Section 30, Township 46 North, Range 3 East.

c. Size Classification

According to the "Recommended Guidelines for Safety Inspection of Dams", by the U.S. Department of the Army, Office of the Chief Engineer, the dam is classified in the dam size category as being "Small" since its height is less than 40 feet. The dam is classified as "Intermediate" in dam size category because its storage is more than 1,000 acre-feet but less than 50,000 acre-feet. The overall size classification is governed by the larger of the two determinations, and the classification is, accordingly, "Intermediate" in size.

d. Hazard Classification

The dam has been classified as having "High" hazard potential in the National Inventory of Dams, on the basis that in the event of failure of the dam or its appurtenances, excessive damage could occur to downstream property, together with the possibility of the loss of life. Our findings concur with the classification. The estimated damage zone extends about 1 1/2 miles downstream of the dam. Within about 0.7 miles downstream from the dam are seven trailers and a bridge under U.S. Highway 40.

e. Ownership

Busch Wildlife Area Lake No. 35 Dam is owned by the Missouri Department of Conservation Commission. The mailing address is Missouri Department of Conservation Commission, c/o Mr. Leroy Heman, Box 180, Jefferson City, Missouri 65102.

f. Purpose of Dam

The purpose of the dam is to impound water for recreational use.

g. Design and Construction History

Busch Wildlife Area Lake No. 35 Dam was designed in May, 1962 by the Missouri Conservation Commission located in Jefferson City, Missouri. According to Mr. Cassady of Busch Wildlife Area, the dam was built in the latter part of 1962 and early part of 1963 by a local contractor named Bernow McMememy. Efforts to locate or contact the contractor were futile.

h. Normal Operational Procedures

Normal procedure for Busch Wildlife Area Lake No. 35 Dam is to allow the reservoir to remain as full as possible with the water level being controlled by rainfall, runoff, evaporation, seepage and the elevation of the spillway crest.

1.3 Pertinent Data

a. Drainage Area (square miles): 3.29

b. Discharge at Damsite

Estimated experienced maximum flood (cfs):	NA
Estimated ungated spillway capacity with reservoir at top of dam elevation (cfs):	2751

c. Elevation (Feet above MSL)

Top of dam:	563.5
Spillway crest:	557.0 (assumed)
Normal Pool:	557.0
Maximum Pool(PMF):	566.7

d. Reservoir

Length of pool with water surface at top of dam elevation:	4800

e. Storage (Acre-Feet)

Top of dam:	1658
Spillway crest:	1001
Normal Pool:	1001
Maximum Pool (PMF):	2119

f. Reservoir Surface (Acres)

Top of dam:	121
Spillway crest:	85
Normal Pool:	85
Maximum Pool(PMF):	146 ±

g. Dam

Type:	Earthfill
Length:	930 feet
Structural Height:	35 feet
Hydraulic Height:	35 feet
Top width:	14.0 feet
Side slopes:	
Downstream	1V to 2.5H
Upstream	1V to 3.75H
Zoning:	Homogeneous
Impervious core:	NA
Cutoff:	Cutoff trench with 10-foot bottom width and 1V to 1H side slopes.
Grout curtain:	Unknown

h. Diversion and Regulating Tunnel None

i. Spillway

Type:	Straight Drop Rectangular Weir, Uncontrolled
Length of weir:	50 feet
Crest Elevation (feet above MSL):	557 feet

j. Regulating Outlets

Type:	12-inch C.I.P. Low Level Drain Pipe
Length:	224 feet (According to Plans)
Closure:	Gate valve, 40 feet upstream of the downstream end.
Maximum Capacity:	Unknown

SECTION 2 : ENGINEERING DATA

2.1 Design

Design drawings are available for the dam from the Missouri Conservation Commission in Jefferson City, Missouri and are included as part of this report. The drawings were prepared in May of 1962 by the Missouri Conservation Commission. No specifications, engineering computations or soil data for this project were available.

2.2 Construction

No data is available concerning the construction of the dam and appurtenant structures, other than the construction history given in Section 1.2g.

2.3 Operation

No operation records are available for the Busch Wildlife Area Lake No. 35 Dam.

2.4 Evaluation

a. Availability

The availability of engineering data is poor and consists only of the design drawings mentioned in Section 2.1, State Geological Maps and U.S.G.S. Quadrangle Sheets. No information on subsurface investigations or soil testing was

available. No information on design hydrology or hydraulic design was available, nor were seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams", which is considered a deficiency.

b. Adequacy

The conclusions presented in this report are based on field measurements, the available engineering data, past performance and present condition of the dam. The data available is adequate to evaluate the hydraulic and hydrologic capabilities of the dam. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions and made a matter of record.

c. Validity

Only a set of design drawings was available for review. From field measurements, the dam appears to have been constructed according to the available drawings, except for the discrepancies described in Section 1.2a. Busch Wildlife Area Lake No. 35 Dam was originally Busch Area Lake No. 41 according to the design drawings provided by the Missouri Conservation Commission.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

A visual inspection of the Busch Wildlife Area Lake No. 35 Dam was made on June 15, 1979. The following persons were present during the inspection:

Name	Affiliation	Disciplines
David J. Kerkes	Engineering Consultants, Inc.	Soils
Peter Howard	Engineering Consultants, Inc.	Geology
Mark R. Haynes	Engineering Consultants, Inc.	Civil, Structural and Mechanical
Kenneth L. Bullard	Engineering Consultants, Inc.	Hydraulics and Hydrology
Kevin Blume	Consoer, Townsend & Assoc., Ltd.	Civil and Structural

Specific observations are discussed below.

b. Dam

The crest of the dam is protected against surface erosion by a well maintained cover of grass. There was no evidence of significant settlement or cracking on the crest. No significant deviations in horizontal or vertical alignment were apparent. There was no evidence of the dam ever being overtopped.

The upstream slope from the crest to the berm was protected from surface erosion by a well maintained cover of grass. No depressions or settlements were apparent on the slope. The upstream edge of the crest of the berm was severely eroded due to wave action. The slope below the berm was protected by riprap. The riprap appeared to have been added after initial construction because of the damage to the crest of the berm due to wave action. No provisions for riprap protection appeared on the design drawings.

Continuous longitudinal and transverse cracks along most of the crest of the upstream berm were observed. The cracks were up to approximately 1 inch wide and up to approximately 12 inches in depth.

The downstream slope of the embankment and the downstream berm were protected from surface erosion by a well maintained cover of grass. No depressions, bulges or settlements were apparent on the downstream slope. No seepage was apparent along the toe of the slope. Materials removed immediately below the vegetation cover on the embankment appeared to be a clayey silt.

No signs of rodent activity in either the embankment or the abutments were apparent.

At the dam site, bedrock was exposed along the edge of the reservoir upstream of the right abutment and in the spillway channels. The rock is a gray, dense, cherty, bedded limestone. The limestone is part of the Burlington-Keokuk limestone formation (Geologic Map of Missouri, 1979). No dip could be measured in the beds in the vicinity of the dam.

c. Appurtenant Structures

(1) Spillways

The concrete rectangular weir structure is in good condition. No spalling or cracking of the concrete was observed. A tree was growing just upstream of the weir. The tree appeared to be collecting debris and may cause any flow over the weir to erode the backfill from behind the structure.

The approach channel to the weir was heavily covered with grass and was not obstructed. Several exposures of limestone bedrock were observed in the channel. No indication of instability in the slopes was apparent.

The discharge channel was excavated into the limestone bedrock. The channel was not obstructed. Seepage was observed in several areas of the channel approximately 75 feet to 200 feet downstream of the weir. The seepage appears to be flowing in the bedding planes of the limestone and the total flow of the seeps is estimated to be less than 1 gpm. The side slopes of the channel were eroded just downstream of the weir. The slopes beyond the eroded area appear to be stable.

(2) Outlet Works

The outlet of the 12-inch diameter C.I.P. low level drain was observed. No seepage through or around the pipe was apparent. The inlet to the pipe was not located. The gate valve housing was located, however, the valve control could not be seen due to the debris on top of it.

d. Reservoir Area

The water surface elevation was approximately 554 feet above MSL on the day of the inspection.

The reservoir rim is gently sloped and no indications of instability or severe erosion were readily apparent. The slopes above the reservoir on the south and the east sides were heavily wooded and on the north and the west sides were grassy. No houses were built around the reservoir rim.

e. Downstream Channel

The downstream channel of the spillway is a well-defined, open channel. The channel was obstructed by several trees and large piles of rock. Approximately 200 feet downstream of the end of the discharge channel, the channel flows through a concrete box culvert. The culvert has two barrels which are approximately 20 feet high by 10 feet wide. U.S. Highway 40 travels over this box culvert.

3.2 Evaluation

The visual inspection did not reveal any items which are sufficiently significant to indicate a need for immediate remedial action.

The following deficiencies were observed which could affect the safety of the dam or which will require maintenance within a reasonable period of time.

1. The erosion of the upstream berm crest above the riprap protection, if allowed to continue, could jeopardize the structural stability of the embankment.

2. The tree just upstream of the weir poses an obstruction to the normal operation of the spillway and thus jeopardizes the safety of the dam.

3. The erosion of the backfill upstream of the weir could jeopardize the structural stability of the weir.

4. The erosion of the side slopes of the discharge channel just downstream of the weir, if allowed to continue, could jeopardize the structural stability of the weir.

5. The seepage observed in the discharge channel could pose a danger to the safety of the dam.

6. The obstructions in the downstream channel of the spillway will reduce the hydraulic efficiency of the channel.

7. It is unknown whether the cracks observed on the crest of the upstream berm are indicative of shrinkage, slope movement or foundation settlement. The observed cracks should be further investigated to insure that they are not symptomatic of distress in the slope or foundation.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

Busch Wildlife Area Lake No. 35 Dam is used primarily for recreational use. It is part of the August A. Busch Memorial Wildlife Area which is a state owned and operated park. The only operating facility is a 12-inch diameter low level lake drain. The water level in the lake is allowed to remain as full as possible, and is controlled by rainfall, runoff, evaporation and the elevation of the spillway crest.

4.2 Maintenance of Dam

The dam is maintained by personnel employed by Busch Wildlife Area. The downstream and upstream slopes of the embankment are kept mowed and free of trees and brush. There appears to have been no major repairs to the dam itself since its original construction except for possibly the riprap protection placed on the upstream slope which did not appear on the original design drawings.

4.3 Maintenance of Operating Facilities

The only facility located at the damsite which requires any operation is the 12-inch diameter low level lake drain. The control, a gate valve, is located 40 feet upstream from the downstream end of the drain. The gate valve was inaccessible at the time of the inspection due to debris covering it.

4.4 Description of Any Warning System in Effect

The inspection team is not aware of any existing warning system in effect.

4.5 Evaluation

The maintenance at Busch Wildlife Area Lake No. 35 Dam appears to be adequate, however, the remedial measures as described in Section 7 should be undertaken.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design

Busch Wildlife Area Lake No. 35 Dam has a watershed of 2,107 acres. Two upstream dams are located above Busch Wildlife Area Lake No. 35 Dam. A drainage map showing the watershed area and the location of the three dams is presented as Plate 1 in Appendix B. The watershed areas of Upstream Dams #1, and #2 are 228 and 809 acres, respectively. The reservoirs of the Upstream Dam #1 and Upstream Dam #2 drain into Busch Wildlife Area Lake No. 35 Dam. The watershed area between Busch Wildlife Area No. 35 Dam and Upstream Dams #1 and #2 is 1,070 acres. Busch Wildlife Area Lake No. 35 Dam is located on Schote Creek. The dam is about 2.25 miles upstream from the confluence of the Schote Creek and Dardenne Creek.

Evaluation of the hydraulic and hydrologic features of Busch Wildlife Area Lake No. 35 Dam was based on criteria set forth in the Corps of Engineers' "Recommended Guidelines for Safety Inspection of Dams", and additional guidance provided by the St. Louis District of the Corps of Engineers. The Probable Maximum Flood (PMF) was calculated from the Probable Maximum Precipitation (PMP) using the methods outlined in the U.S. Weather Bureau Publication, Hydrometeorological Report No. 33. The probable maximum storm duration was set at 24 hours, and storm rainfall distribution was based on criteria given in EM 1110-2-1411 (Standard Project Storm). The SCS method was used for deriving the unit hydrographs,

utilizing the Corps of Engineers' computer program HEC-1 (Dam Safety Version). Three unit hydrographs, one for each of the three dams were derived. The parameters of the unit hydrographs are presented in Appendix B. The SCS method was used for determining the loss rate. The hydrologic soil group of the watershed was determined by use of the published soil maps. The hydrologic soil group of the watershed and the SCS curve number are also presented in Appendix B. The curve number, unit hydrograph parameters, and the PMP rainfall were directly input to the HEC-1 (Dam Safety Version) computer program to obtain the PMF hydrographs. The computed peak discharges of the PMF for Upstream Dams #1 and #2, and Busch Wildlife Area Lake No. 35 Dam are 3,021, 9,772 and 12,119 cfs, respectively. The computed peak discharges for one-half of the PMF for the three dams are one-half of the PMF values.

Both the PMF and one-half of the PMF inflow hydrographs at the upstream dams were routed through the upstream reservoirs by the Modified Puls Method, also utilizing the HEC-1 (Dam Safety Version) computer program. The peak outflow discharges for the PMF and one-half of the PMF at Upstream Dam #1 are 2,866 and 1,424 cfs, respectively. The peak outflow discharges for the PMF and one-half the PMF at Upstream Dam #2 are 8,609 and 3,886 cfs, respectively. The outflow hydrographs at Upstream Dams #1 and #2 were combined with the inflow hydrograph for Busch Wildlife Area Lake No. 35 Dam. The combined inflow discharges for the PMF and one-half of the PMF for Busch Wildlife Area Lake No. 35 Dam are 23,318 cfs and 11,072 cfs, respectively. The combined hydrographs for both the PMF and one-half of the PMF, were routed through Busch Wildlife Area Lake No. 35 Dam. The peak outflow discharges for the PMF and one-half of the PMF at Busch Wildlife Area Lake No. 35 Dam are 20,402 and 7,935 cfs, respectively. Both the PMF and one-half of the PMF when routed through the Busch

Wildlife Area Lake No. 35 Dam reservoir resulted in overtopping of the dam.

The stage-outflow relation for the spillway was prepared from field notes and sketches prepared during the field inspection, and some limited design drawings. The reservoir stage-capacity data were based on the U.S.G.S. Weldon Spring, Missouri Quadrangle topographic map (7.5 minute series). The spillway and overtop rating curve and the reservoir capacity curve for Busch Wildlife Area Lake No. 35 Dam are presented as Plates 2 & 3, respectively in Appendix B.

From the standpoint of dam safety, the hydrologic design of a dam aims at avoiding overtopping. Overtopping is especially dangerous for an earth dam because the downrush of waters over the crest can erode the dam embankment and release all the stored water suddenly into the downstream floodplain. The safe hydrologic design of a dam requires a spillway discharge capability, in combination with an embankment crest height that can handle a very large and exceedingly rare flood without overtopping.

The Corps of Engineers designs its dams to safely pass the Probable Maximum Flood that is estimated could be generated from the upstream watershed. This is the generally accepted criterion for major dams throughout the world, and is the standard for dam safety where overtopping would pose any threat to human life. According to the Corps criteria, the hydrologic requirement for safety for this dam is the capability to pass the Probable Maximum Flood without overtopping.

b. Experience Data

It is believed that no records of reservoir stage or spillway discharge are maintained for this site.

c. Visual Observations

Observations made of the spillway during the visual inspecton are discussed in Section 3.1c(1) and evaluated in Section 3.2.

d. Overtopping Potential

As indicated in Section 5.1a, both the Probable Maximum Flood and one-half of the Probable Maximum Flood, when routed through the reservoir, result in overtopping of the dam. The peak outflow discharges for the PMF and one-half of the PMF are 20,402 cfs and 7,935 cfs, respectively. The PMF overtopped the dam crest by 3.20 feet and one-half of the PMF overtopped the dam crest by 1.36 feet. The total duration of embankment overflow is 5.50 hours during the PMF, and 2.92 hours during one-half of the PMF. The spillway and the reservoir of Busch Wildlife Area Lake No. 35 Dam is capable of accommodating a flood equal to approximately 31 percent of the PMF just before overtopping the dam. The spillway/reservoir system of Busch Wildlife Area Lake No. 35 Dam will accommodate the 100-year flood without overtopping.

The failure of the dam could cause extensive damage to the property downstream of the dam and possible loss of life. The estimated damage zone extends about 1 1/2 miles downstream of the dam. Within the damage zone are seven trailers and a bridge under U.S. Highway 40.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

Extensive longitudinal and transverse cracks were observed on the crest of the upstream berm. Many cracks were continuous over large areas. The maximum width was about 1 inch with measured depths to 12 inches. There were no other signs of settlement or distress observed on the embankment or foundation during the visual inspection.

The severe erosion of the upstream berm due to wave action was not serious enough to constitute an unsafe condition at this time. The erosion of the upstream berm was above the riprap protection, which made it appear that the riprap protection was placed on the upstream slope after the erosion occured.

The spillway weir did not show any structural instability at this time. Nevertheless, the tree and the erosion of the backfill just upstream of the weir and the erosion of the side slopes of the discharge channel just downstream of the weir may pose a danger to the structural stability of the weir in the future.

The low level lake drain did not show any sign of structural instability. Nevertheless, the gate valve should be operated to determine if it is operable and verify that drain is not clogged. If the drain does not function, necessary repairs should be made in case the reservoir has to be lowered for any reason.

The seepage through the limestone in the discharge channel does not pose a danger to the stability of the dam in its present condition. Nevertheless, the seepage should be monitored because there is possibility that the seepage channels could be enlarged by solution.

The limestone bedrock is a competent and satisfactory foundation for the dam, the spillway weir and the spillway channels.

b. Design and Construction Data

No design computations were uncovered during the report preparation phase. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available. No embankment or foundation soil parameters are available for carrying out a conventional stability analysis on the embankment. No construction data or specifications relating to the degree of embankment compaction are available for use in a stability analysis.

c. Operating Records

No operating records are available relating to the stability of the dam or appurtenant structures. The water level on the day of inspection was 3 feet below the crest of spillway weir and it is assumed that the reservoir remains close to full at all times. The low level lake drain should be operated as described in Section 6.1a.

d. Post Construction Changes

No post construction changes exist which will affect the structural stability of the dam, except for possibly the riprap protection placed on the upstream slope which did not appear on the original design drawings.

e. Seismic Stability

The dam is located in Seismic Zone 2, as defined in "Recommended Guidelines for Safety Inspection of Dams" as prepared by the Corps of Engineers, and therefore, does not require a seismic stability analysis.

SECTION 7: ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment

The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

It should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is also important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that an unsafe condition could be detected.

a. Safety

The spillway capacity of Busch Wildlife Area Lake No. 35 Dam was found to be "Seriously Inadequate". The spillway/reservoir system will acommodate only 31 percent of the PMF without overtopping the dam. The spillway and the reservoir will accommodate the 100-year flood without overtopping.

If loess indeed constitutes a portion of the foundation as the geology of the area indicates, it is quite possible that the cracking is a result of settlement in the foundation. An increase in the water content of the loess as the reservoir filled could induce considerable post construction settlement since wetting has a radical affect on the consolidation properties of loess. Therefore, without further investigation, it is not possible to determine whether the cracks are due to settlement, shrinkage, or are symptomatic of distress in the slope.

The severe erosion of the upstream berm above the riprap protection due to wave action should be repaired and protected within a reasonable period of time. The dam embankment appears to be in good structural condition, except for possibly the cracking as described above. No seepage and stability analyses were available for review.

The tree and the erosion of the backfill just upstream of the weir and the erosion of the side slopes of the discharge channel just downstream of weir pose a potential danger to the safety of the dam and an obstruction to the normal operation of the spillway. These conditions should be repaired and protected within a reasonable period of time.

The seepage observed in the discharge channel of the spillway does not pose a danger to the safety of the dam in its present condition. However, the seepage should be monitored for any changes in quantity, location or color and any changes reported.

The trees and debris in the downstream channel of the spillway should be removed. The channel should be kept clean of trees and debris.

b. Adequacy of Information

The conclusions presented in this report are based on field measurements, the available engineering data, past performance and present condition of the dam. Information on the design hydrology, hydraulic design, and the operation and maintenance of the dam as well as seepage and stability analyses were not available.

c. Urgency

A program should be developed as soon as possible to monitor at regular intervals the deficiencies described in this report. The remedial measures recommended in Paragraph 7.2 should be accomplished in the near future. The item recommended in Paragraph 7.2a should be pursued on a high priority basis.

d. Necessity for Phase II Inspection

Based on results of the Phase I inspection, and if the remedial measures recommended in Paragraph 7.2 are undertaken as soon as possible, a Phase II inspection is not felt to be necessary.

7.2 Remedial Measures

The following remedial measures should be performed under the guidance of an engineer experienced in the design and construction of earth dams.

a. Alternatives:

Spillway capacity and/or height of the dam should be increased to accommodate the PMF without overtopping the dam. The overtopping depth during the occurrence of the PMF, stated elsewhere in this report is not the required or recommended increase in height of the dam.

b. O & M Procedures:

1. The observed cracking should be further investigated to insure that it is not symptomatic of distress in the slope. Large cracks should be trenched and properly backfilled.

2. Repair erosion due to wave action on the upstream slope and protect the slope from further damages.

3. Remove the tree and repair the erosion just upstream of the spillway weir.

4. Repair the erosion of the side slopes of the discharge channel just downstream of the spillway weir.

5. Remove the obstructions in the downstream channel of the spillway.

6. Seepage and stability analyses should be performed by a professional engineer experienced in the design and construction of earthen dams.

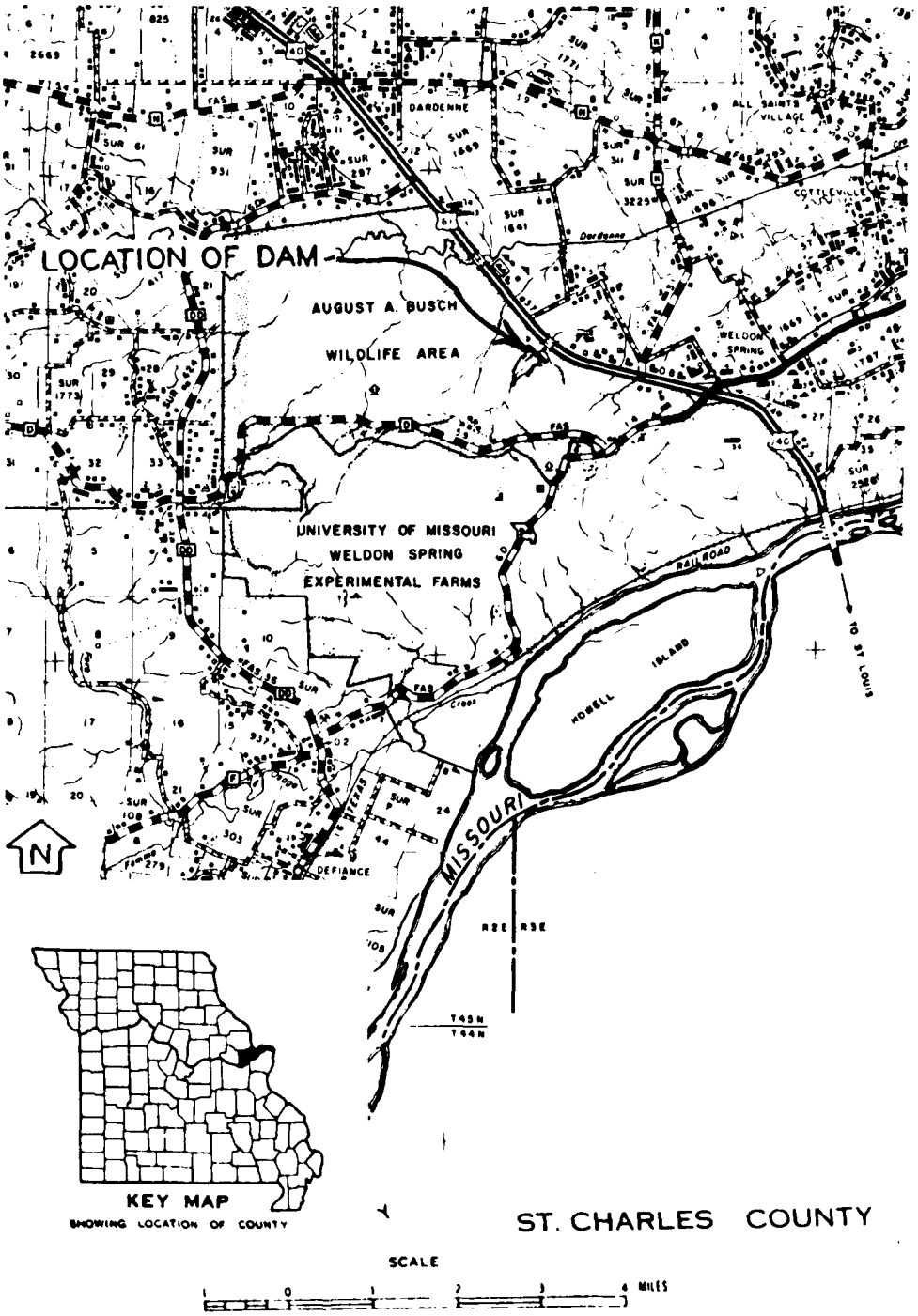
7. Monitor the seepage in the discharge channel for any changes in quantity, location or color and report any changes.

8. The owner should initiate the following programs:

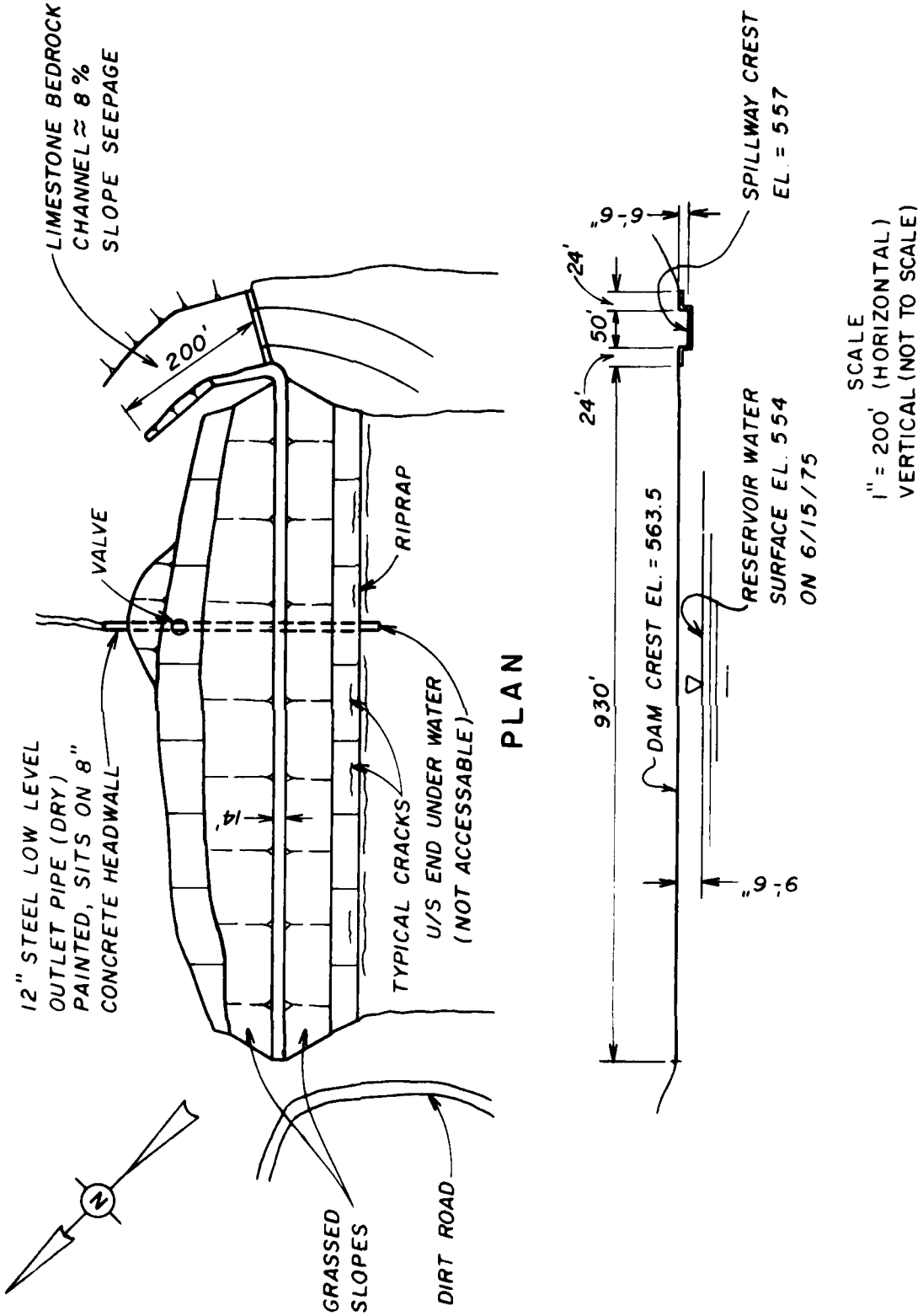
   (a) Periodic inspection of the dam by a professional engineer experienced in the design and construction of earthen dams.

   (b) Set up a maintenance schedule and log all visits to the dam for operation, repairs and maintenance.

PLATES



LOCATION MAP - BUSCH WILDLIFE AREA LAKE # 35 DAM



BUSH WILDLIFE AREA LAKE NO. 35 DAM (MO. 10092)
PLAN & ELEVATION

AUGUST A. BUSCH MEMORIA

ST. CHARLES COUNTY, M

PLANS FOR CONSTRUCTION O

3

MEMORIAL WILDLIFE AREA

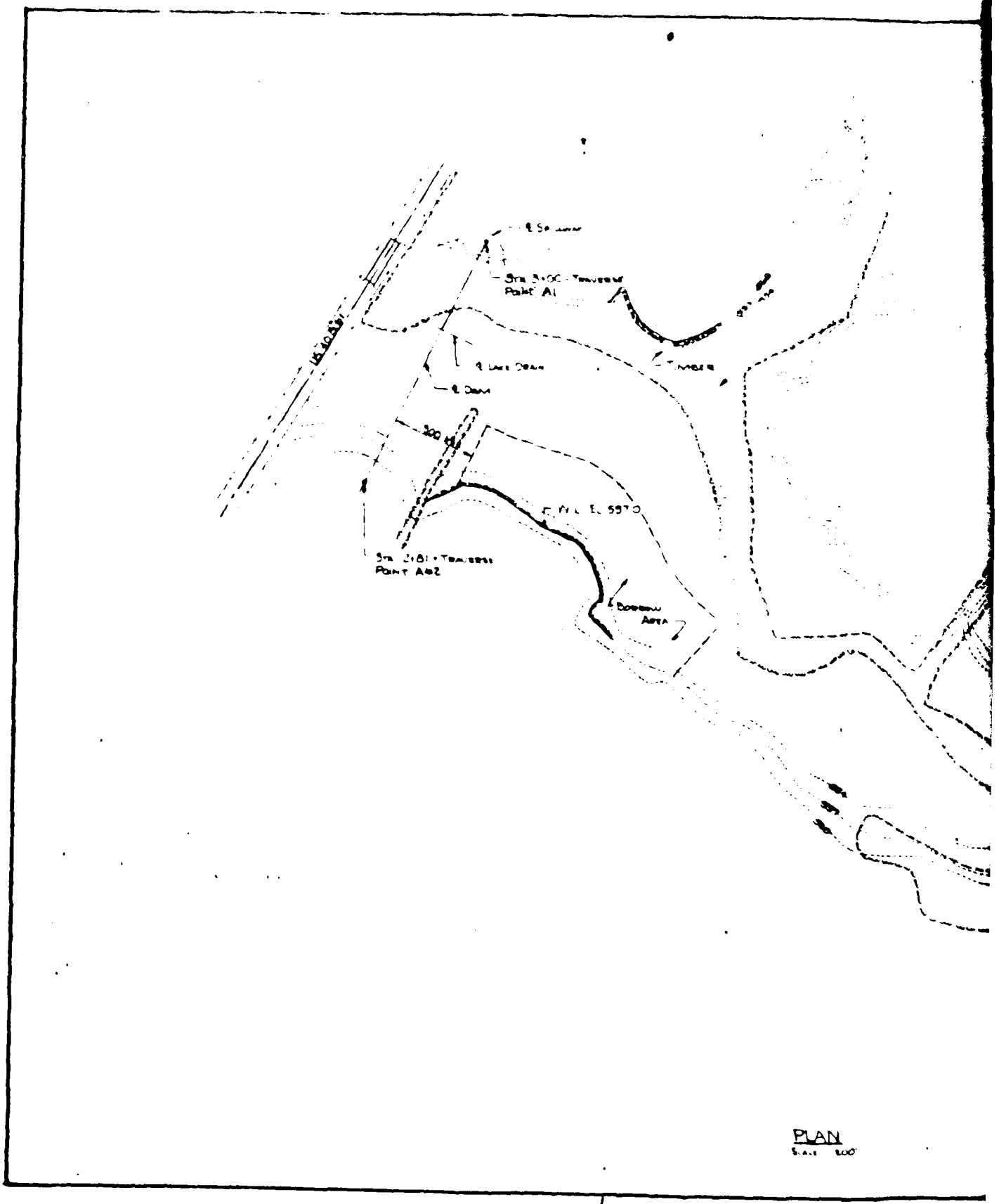
LES COUNTY, MISSOURI

ICTION OF LAKES ~~41 AND 51~~ 35

~~(Now designated as 35)~~

MICROFILMED

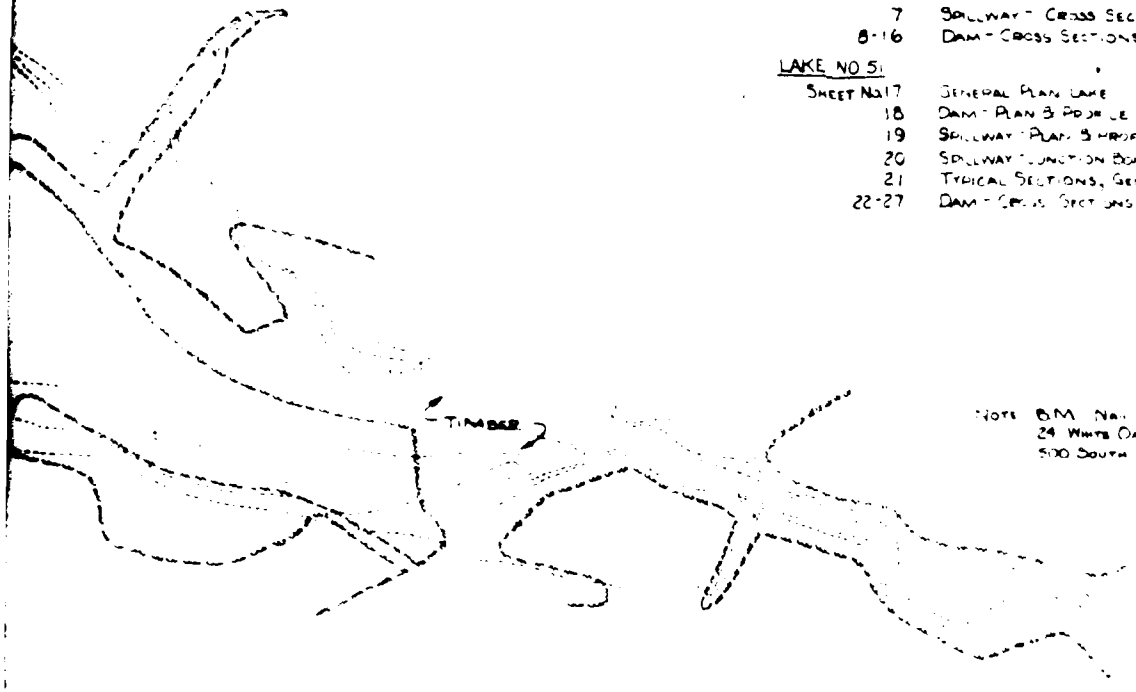
DATE



PLAN

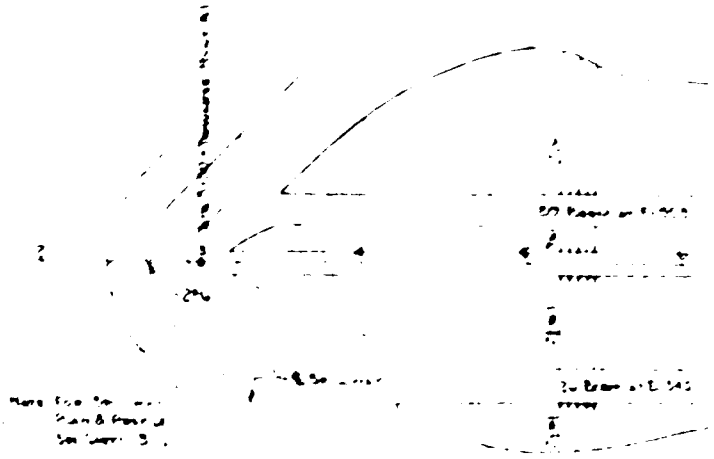
VICINITY MAP

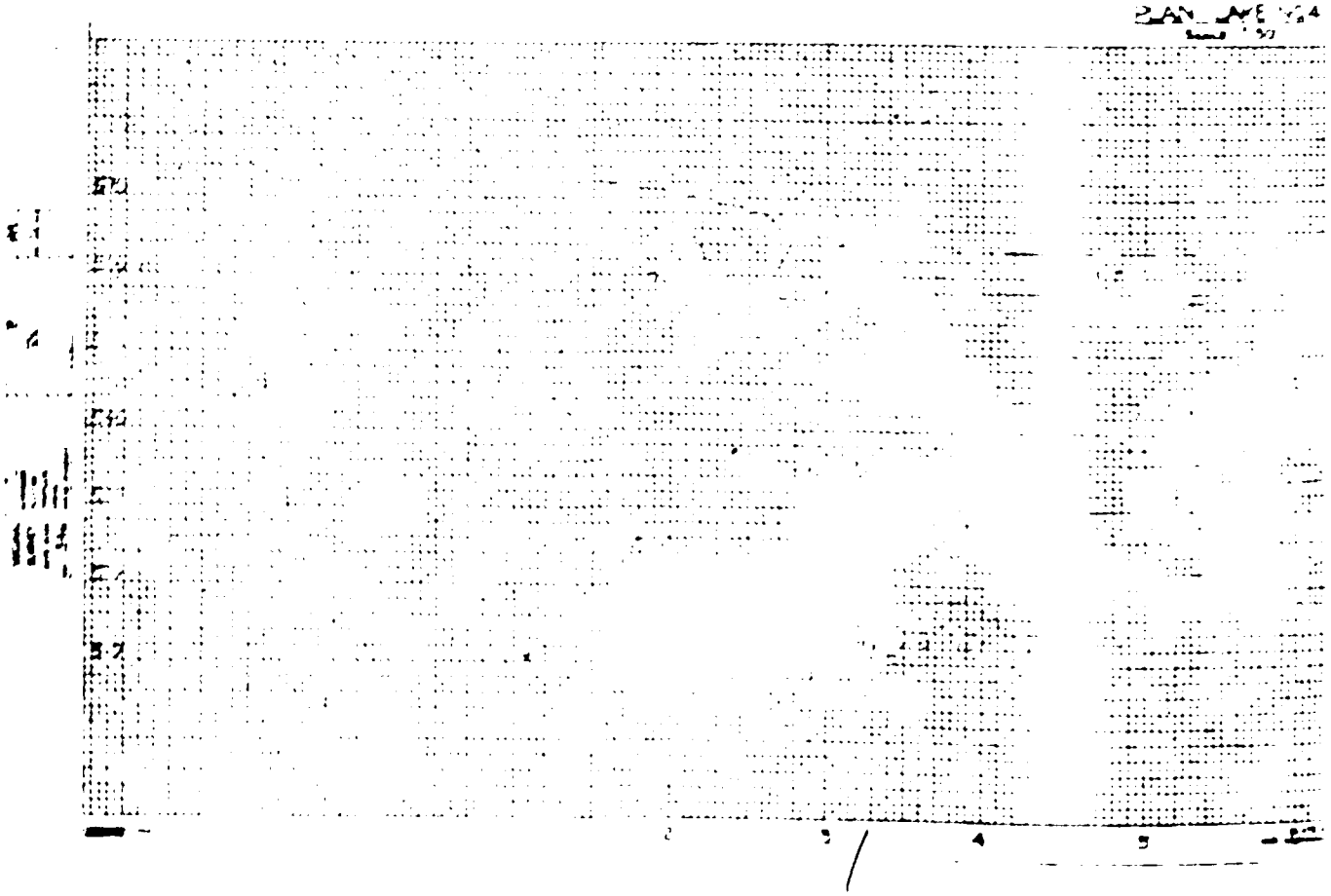
INDEX

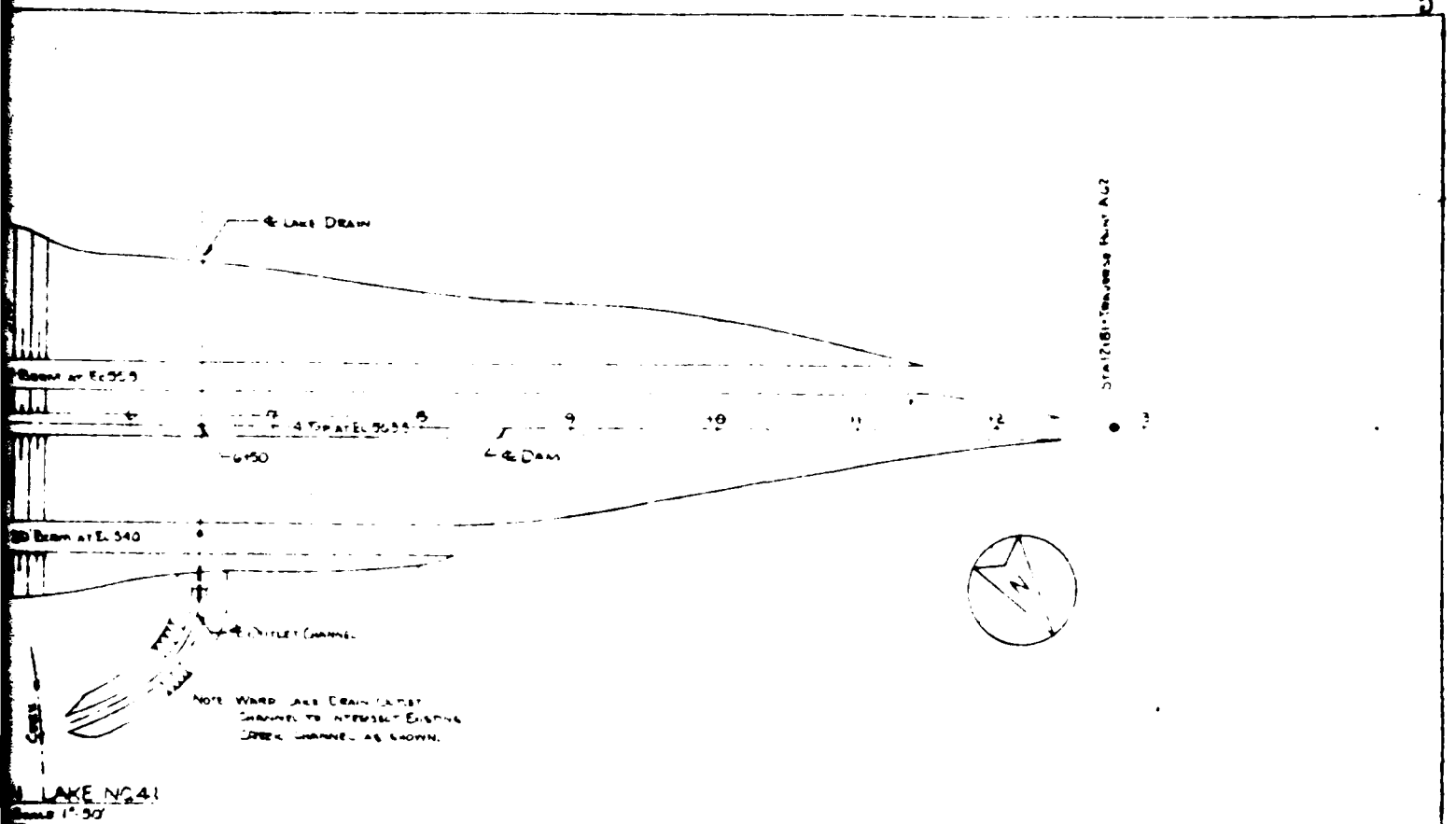


Note B.M. Nail in west side of
24 White Oak Tree approx
500 South Sta 5+00 Dam.

DESIGNED 5-62 CEH	MISSOURI CONSERVATION COMMISSION
DETAILED 5-62 [illegible]	GENERAL PLAN
CHECKED 5-62 CEH	LAKE 41 & 35
APPROVED	SHEET 1 OF 27
	DATE MAY 62
	JOB NO 99-63

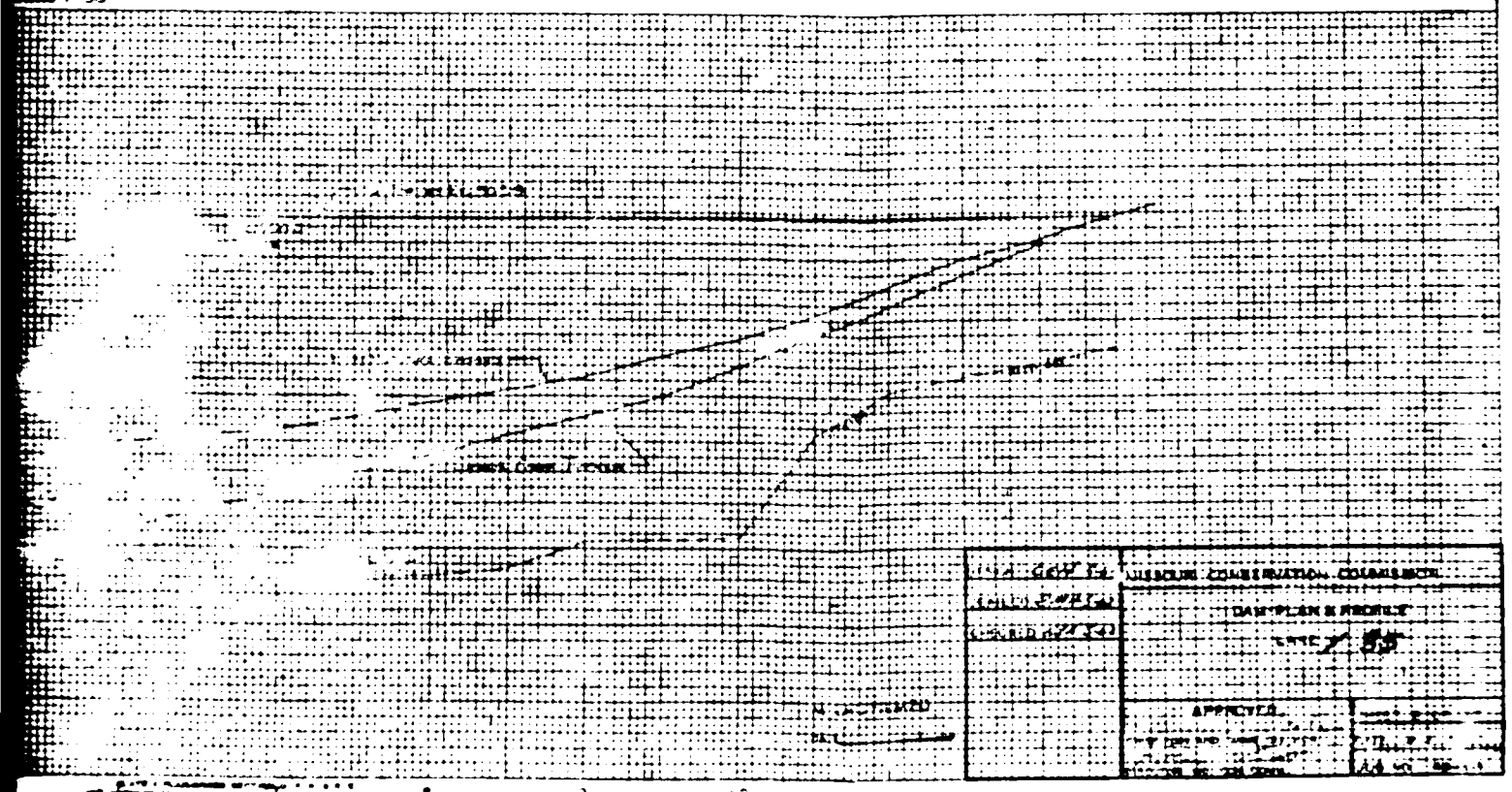


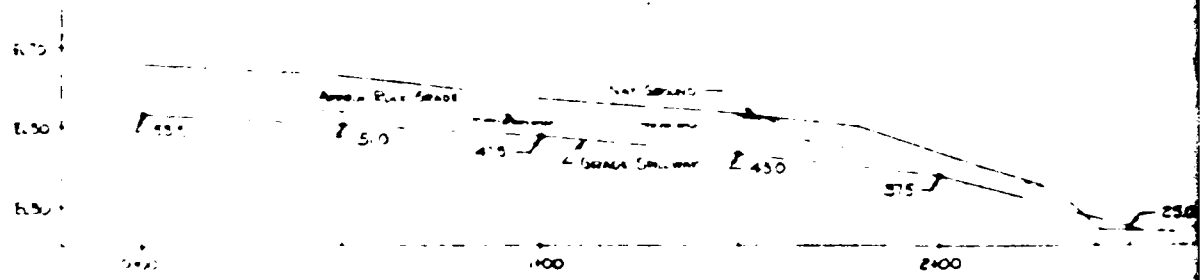




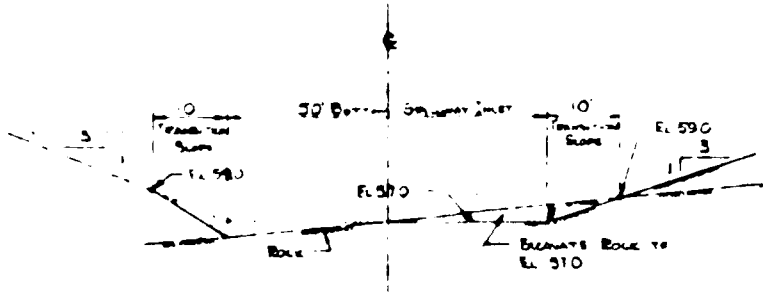
LAKE No. 41

Scale 1" = 50'





PROFILE ALONG ℄ SPILLWAY



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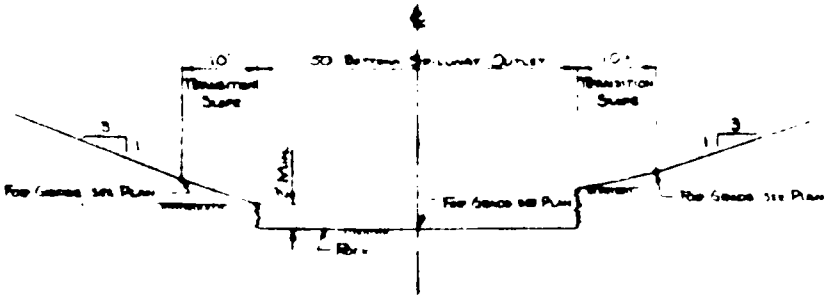

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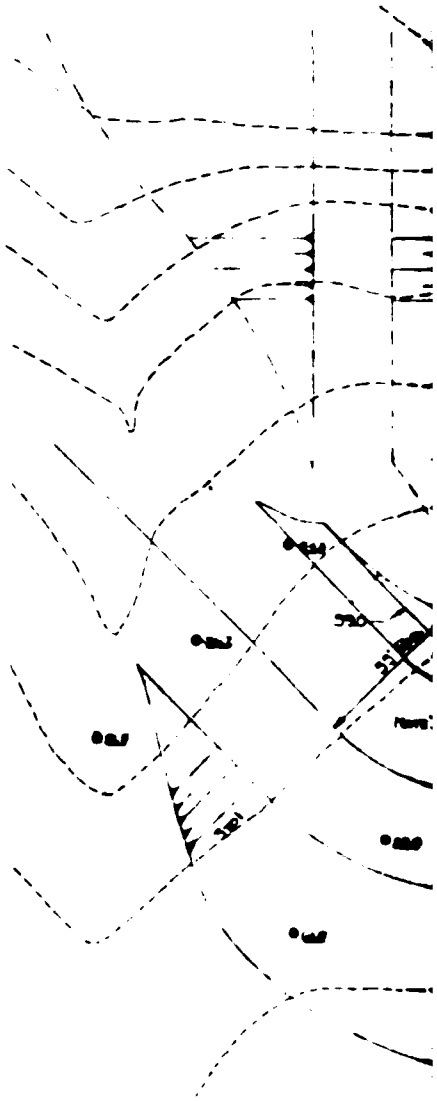
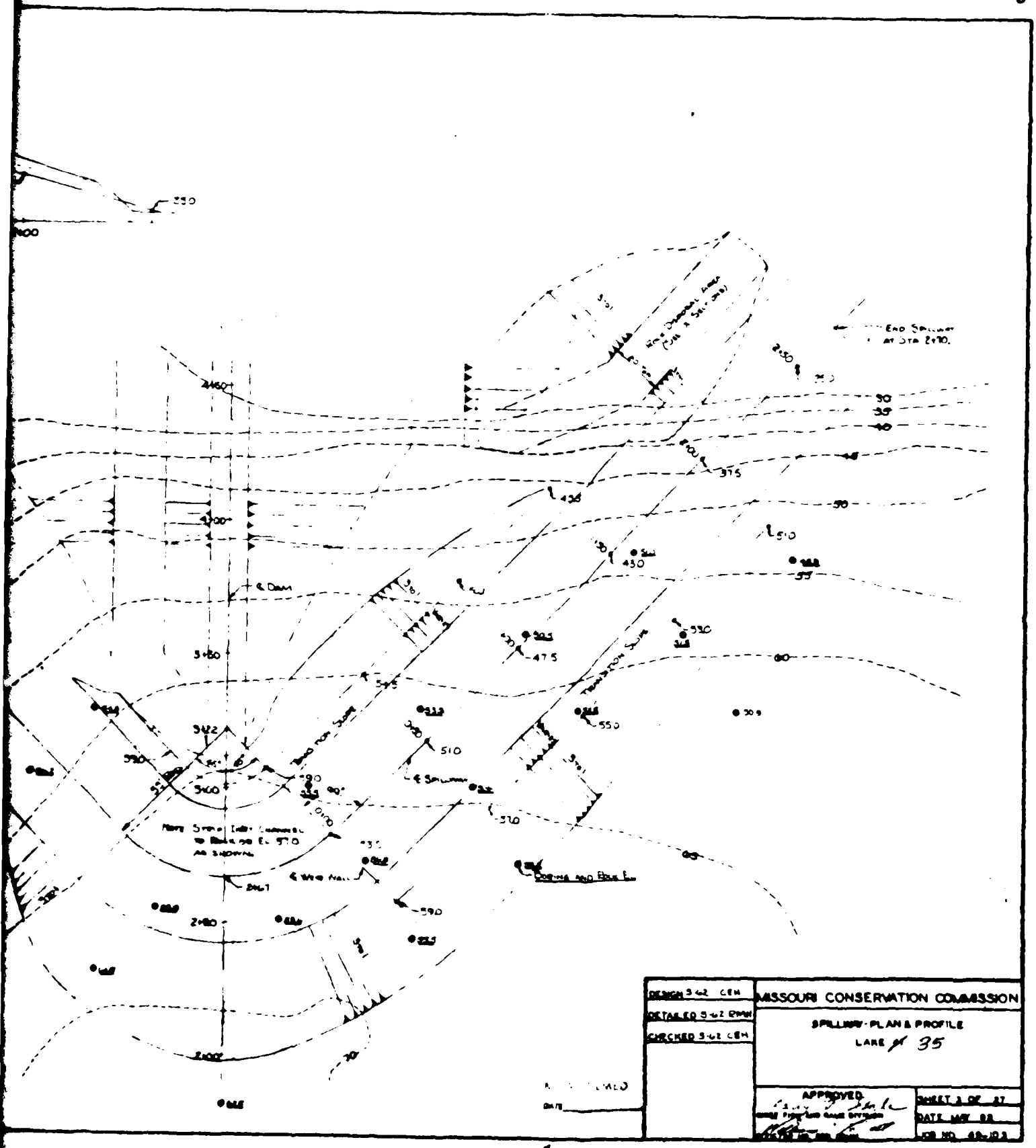
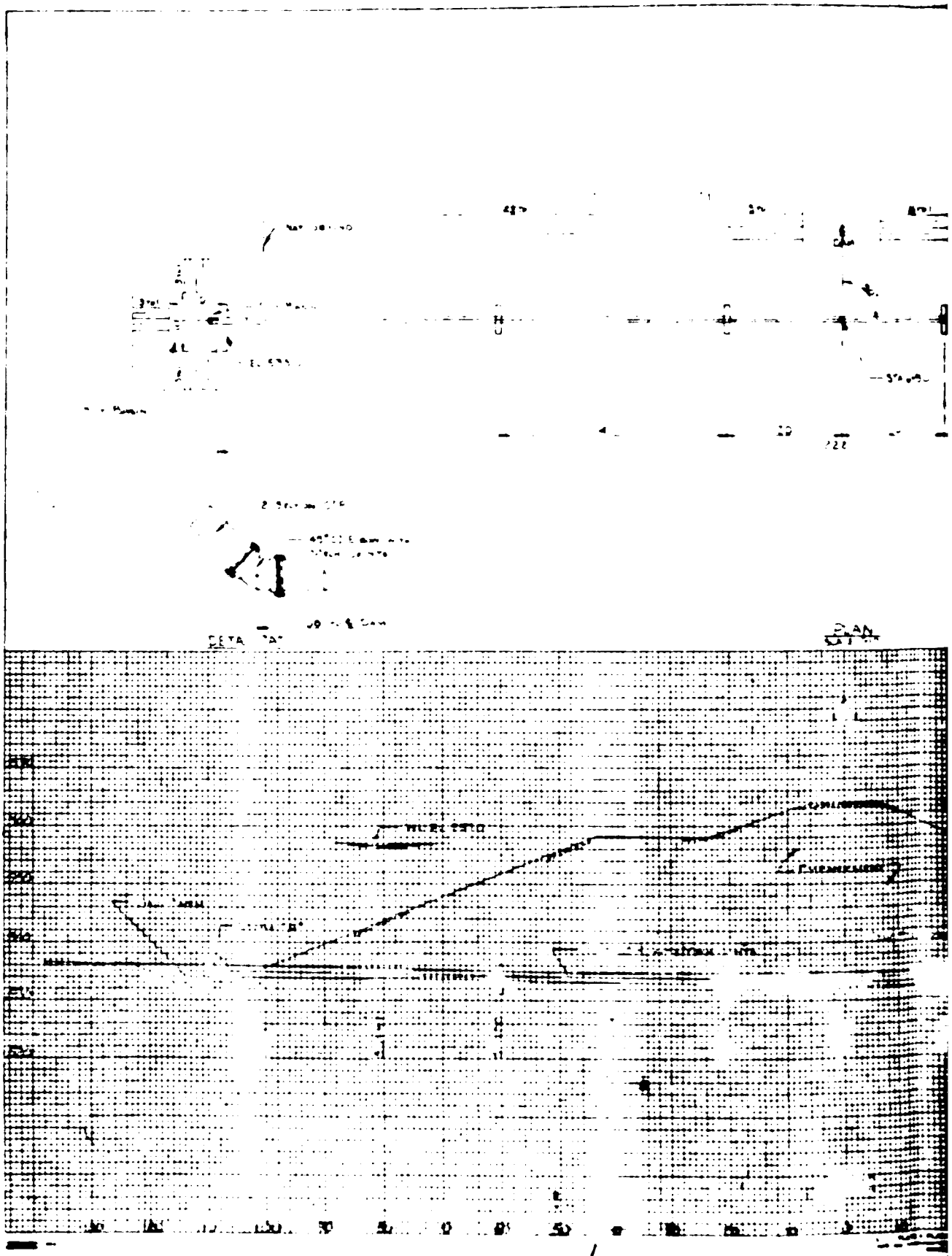
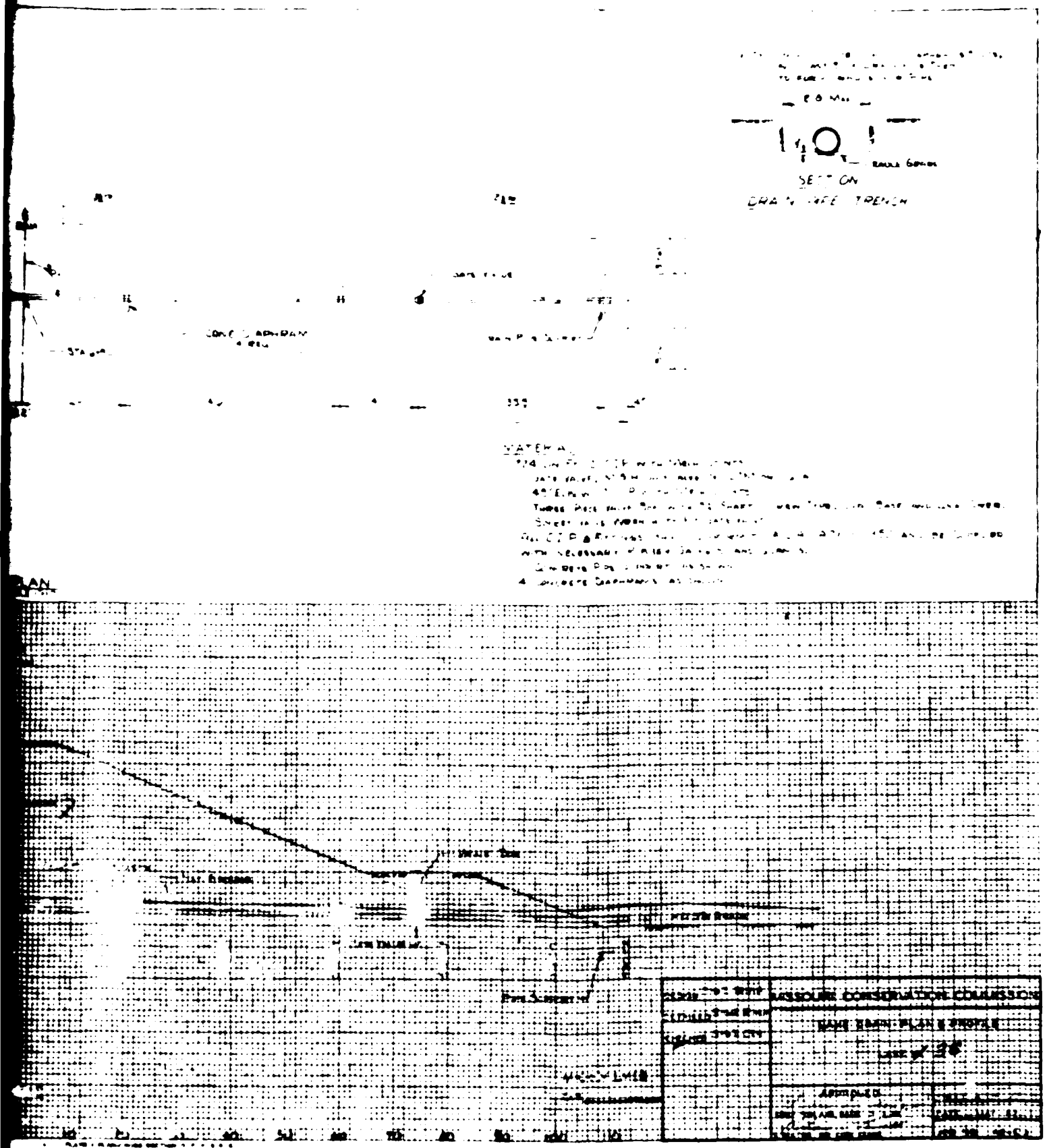



End Spillway at Sta 2+70.
℄ Dam
Transition Slope
℄ Spillway
Dashed and Rock Fill
DESIGN S-62 CEM
DETAILED S-62 RMW
CHECKED S-62 CEM
MISSOURI CONSERVATION COMMISSION
SPILLWAY - PLAN & PROFILE
LAKE # 35
APPROVED
SHEET 3 OF 27
DATE MAY 68
JOB NO. 68-103

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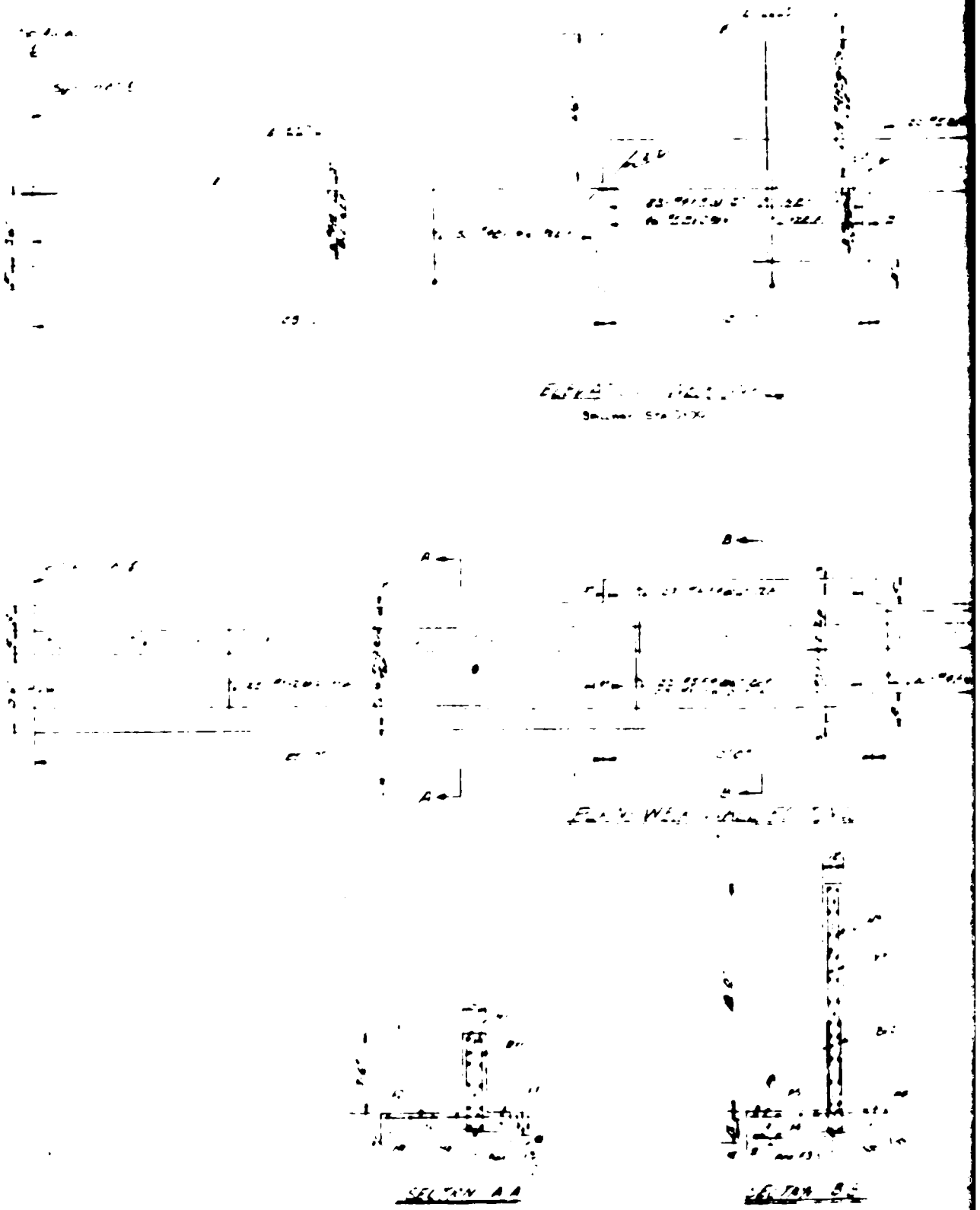
MISSOURI CONSERVATION COMMISSION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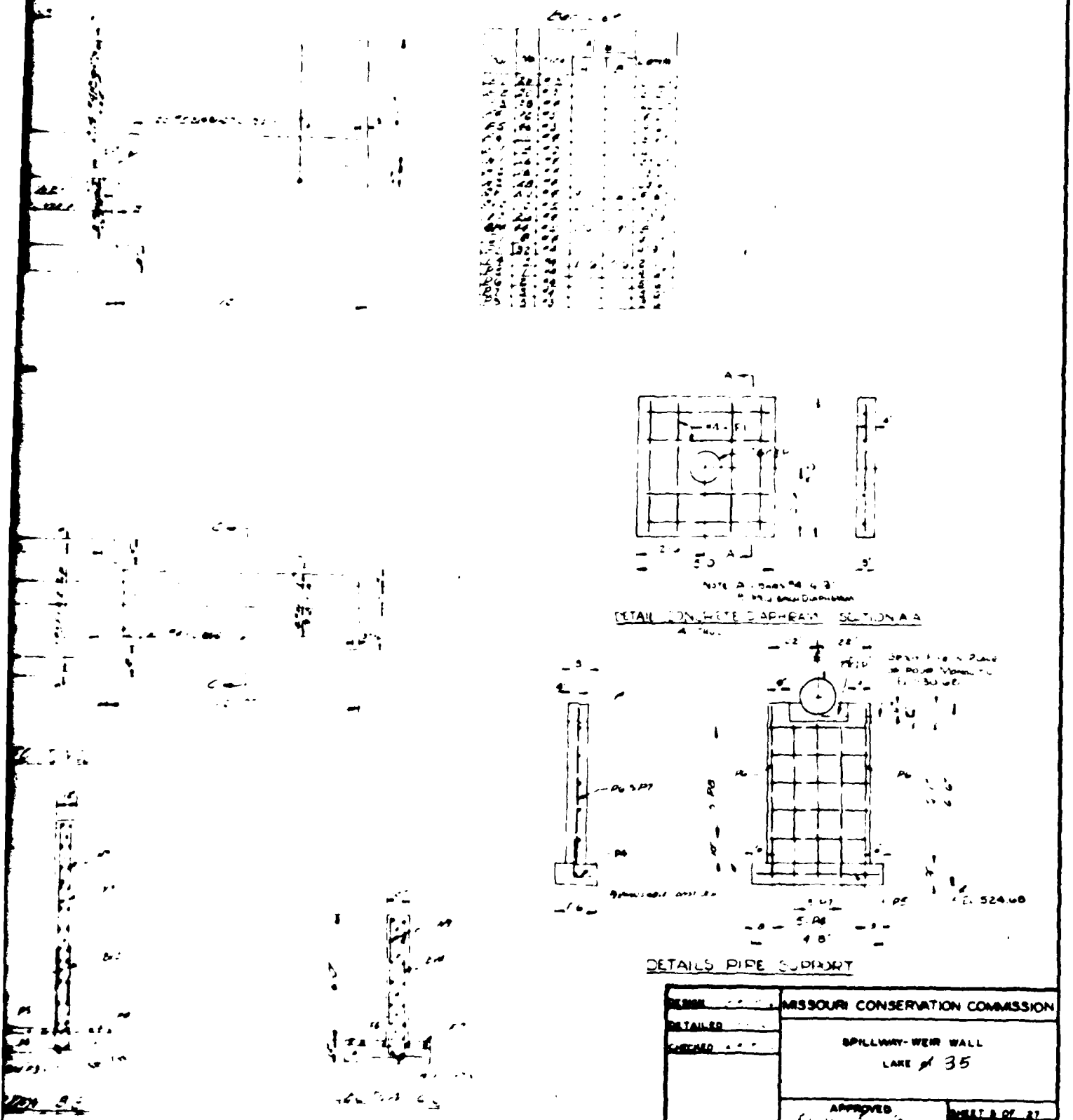
SECTION B-B


DETAIL CONCRETE DIAPHRAGM SECTION A-A
DETAILS PIPE SUPPORT
524.00
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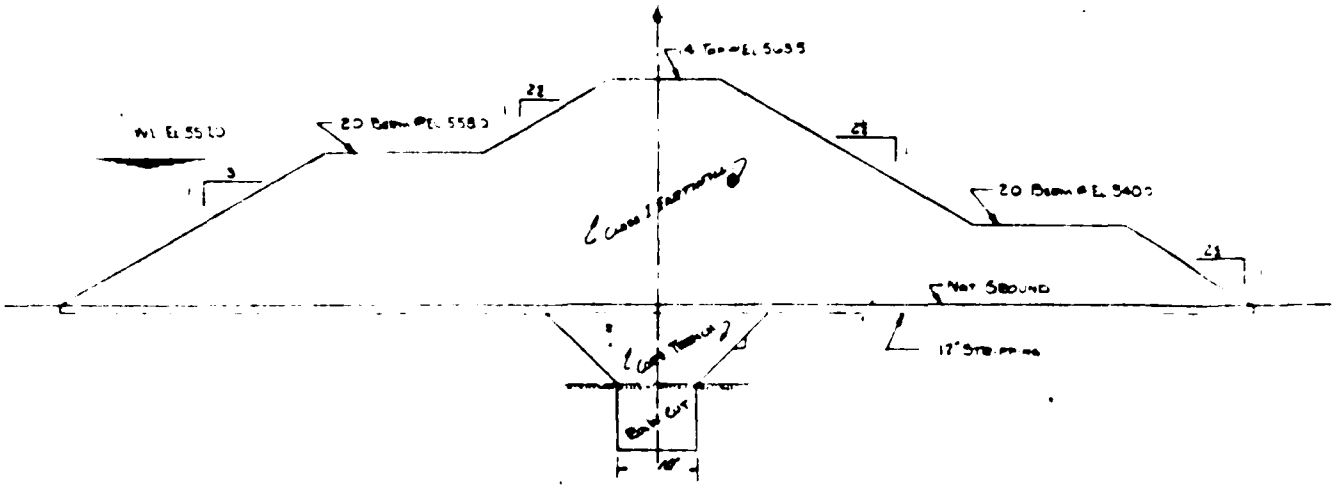
SPILLWAY-WEIR WALL
LAKE # 35
APPROVED
SHEET 8 OF 27
DATE MAR 88
JOB NO 49-103



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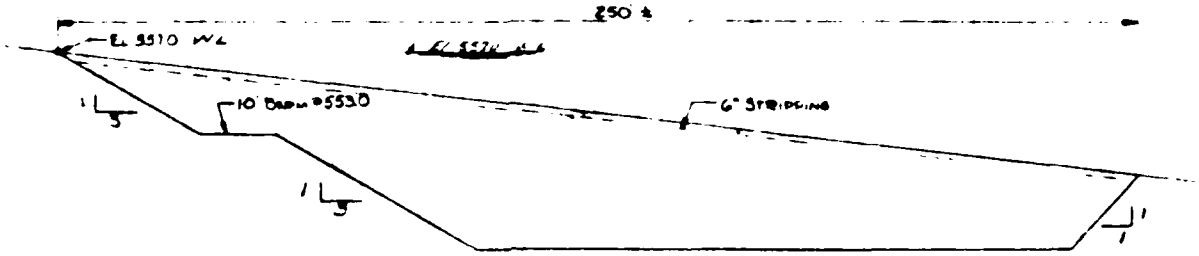
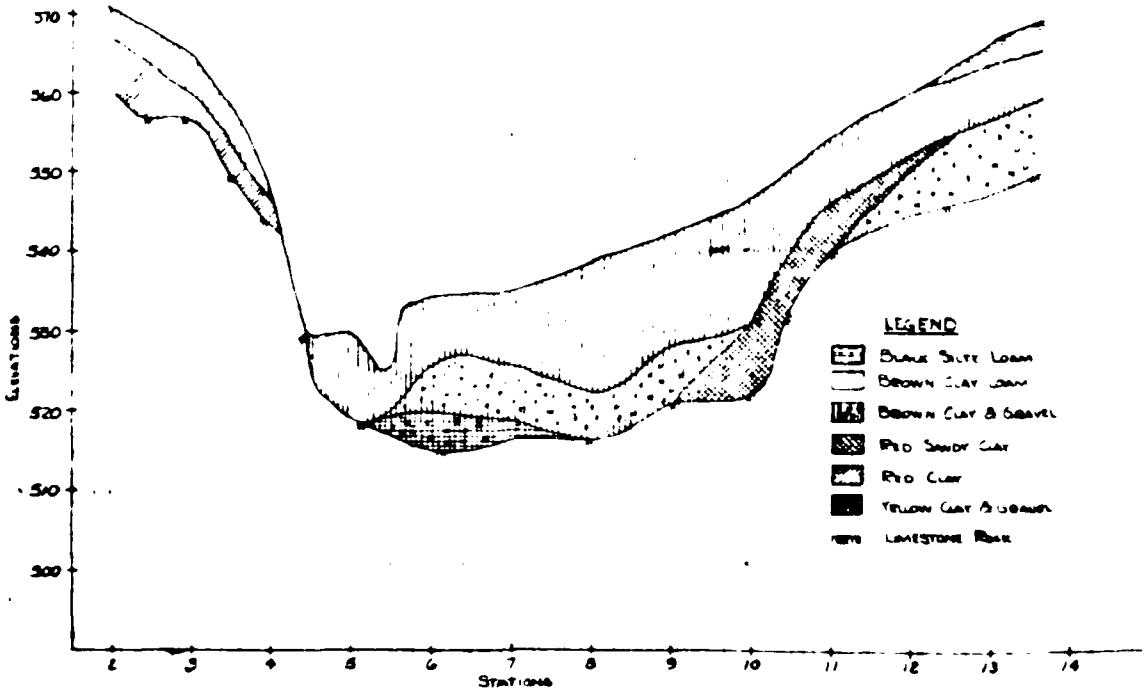


TYPICAL SECTION BORROW AREA



PROFILE SOIL ALONG ℄ DAM

GENERAL NOTES

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[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

QUANTITIES		
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ROCK EXCAVATION	[illegible]	[illegible]
CLASS A CONCRETE	49	CU YDS
METAL REINFORCEMENT	3,720	LBS
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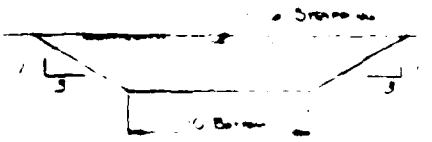
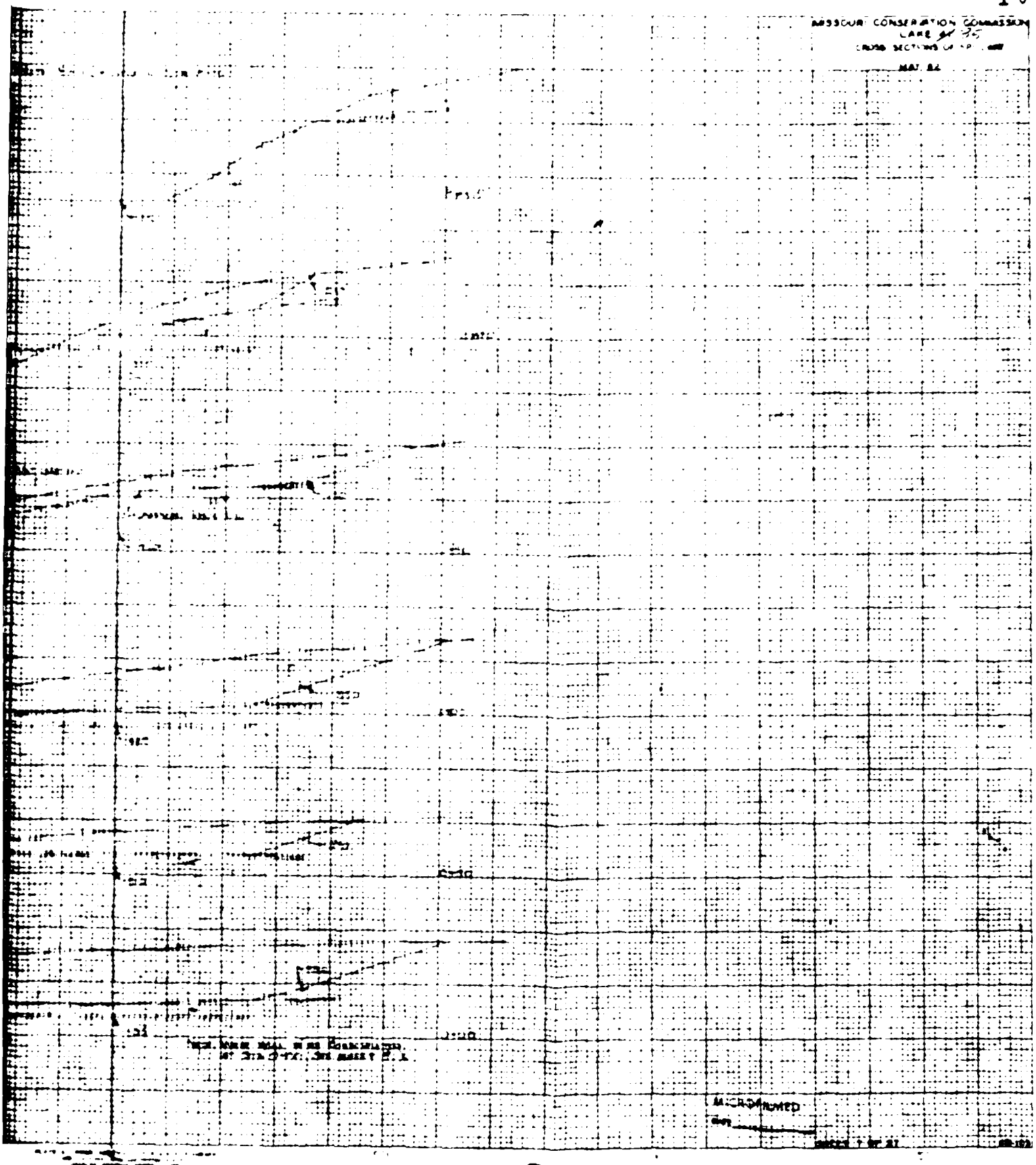
SEEDING	3	ACRES
LAKE DRAIN	224	LIN FT
GATE VALVE	1	EA

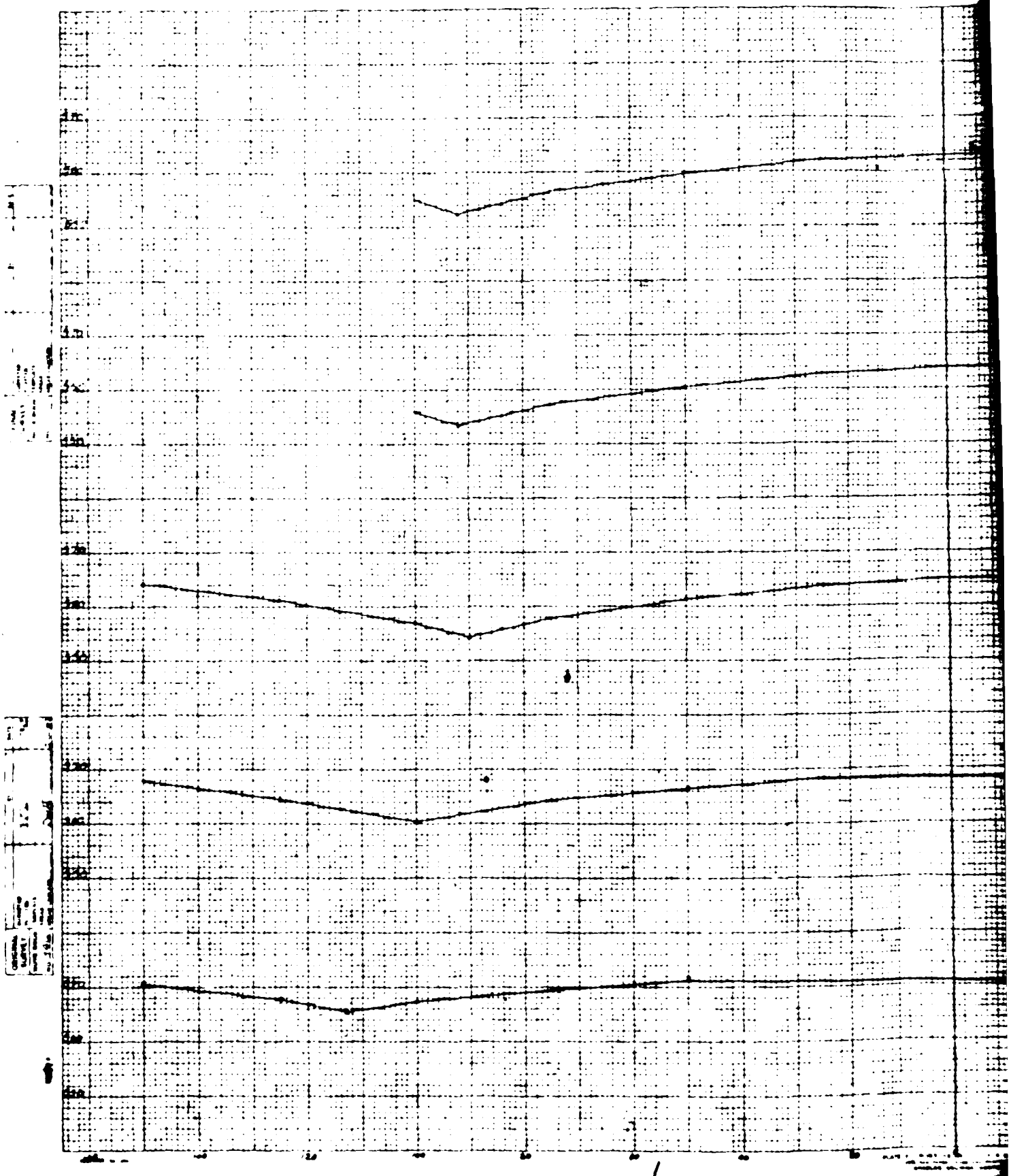


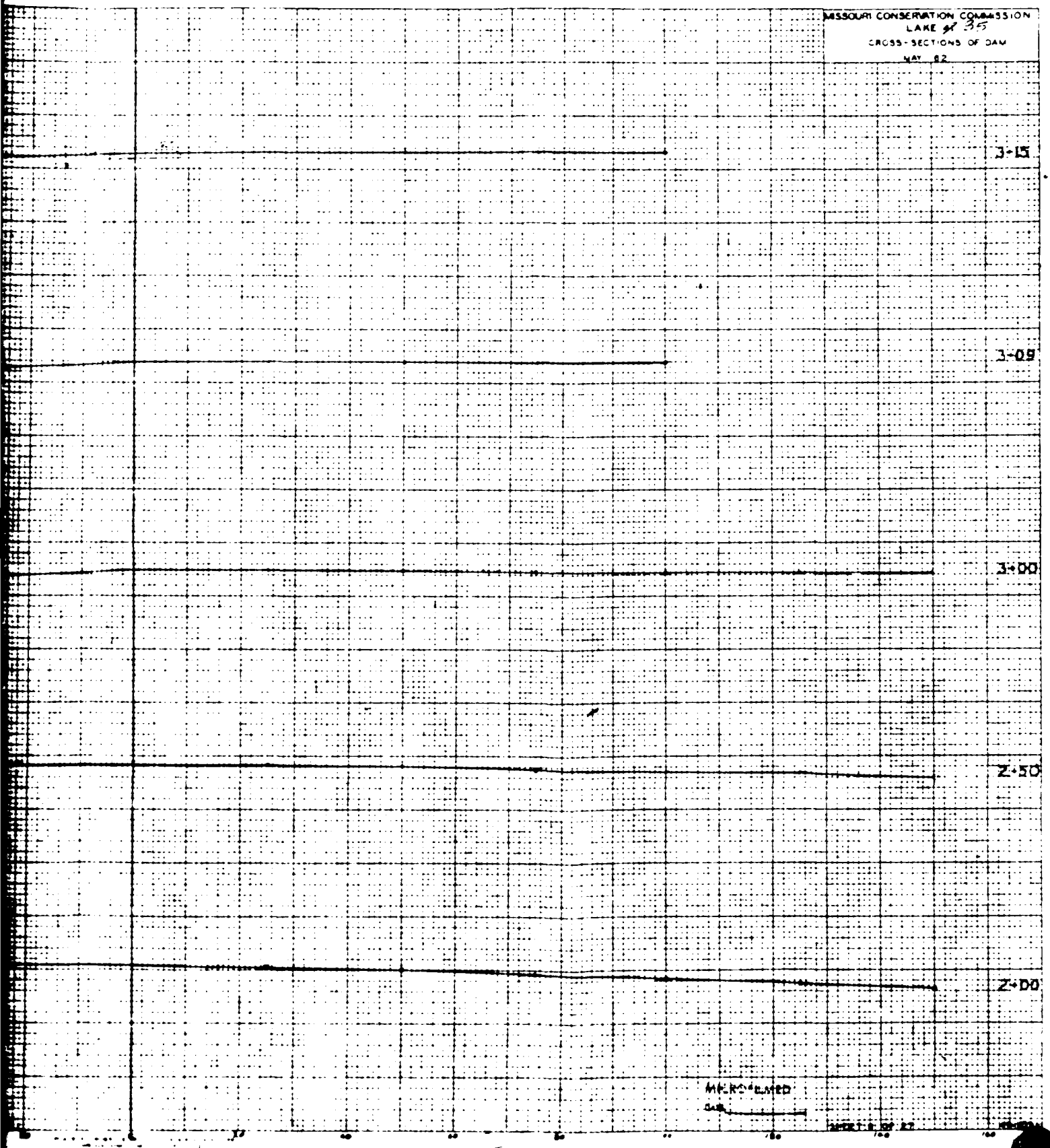
TYPICAL SECTION OUTLET CHANNEL
FOR LAKE DRAIN

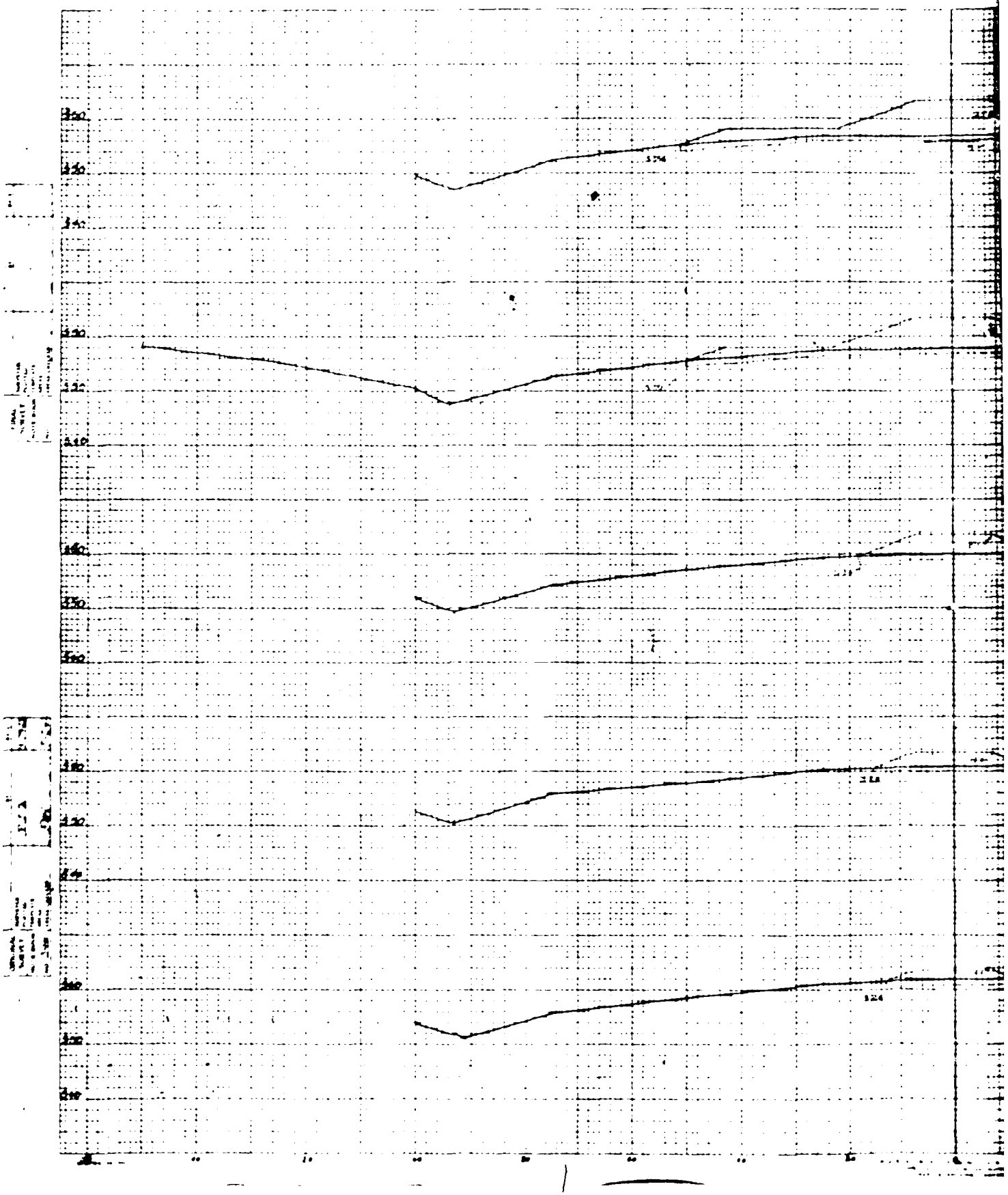
DESIGN	MISSOURI CONSERVATION COMMISSION
DETAILED	TYPICAL SECTIONS & NOTES
CHECKED	LAKE [illegible] of 56
	APPROVED
	SHEET [illegible] OF [illegible]
	DATE [illegible]
	JOB NO. [illegible]

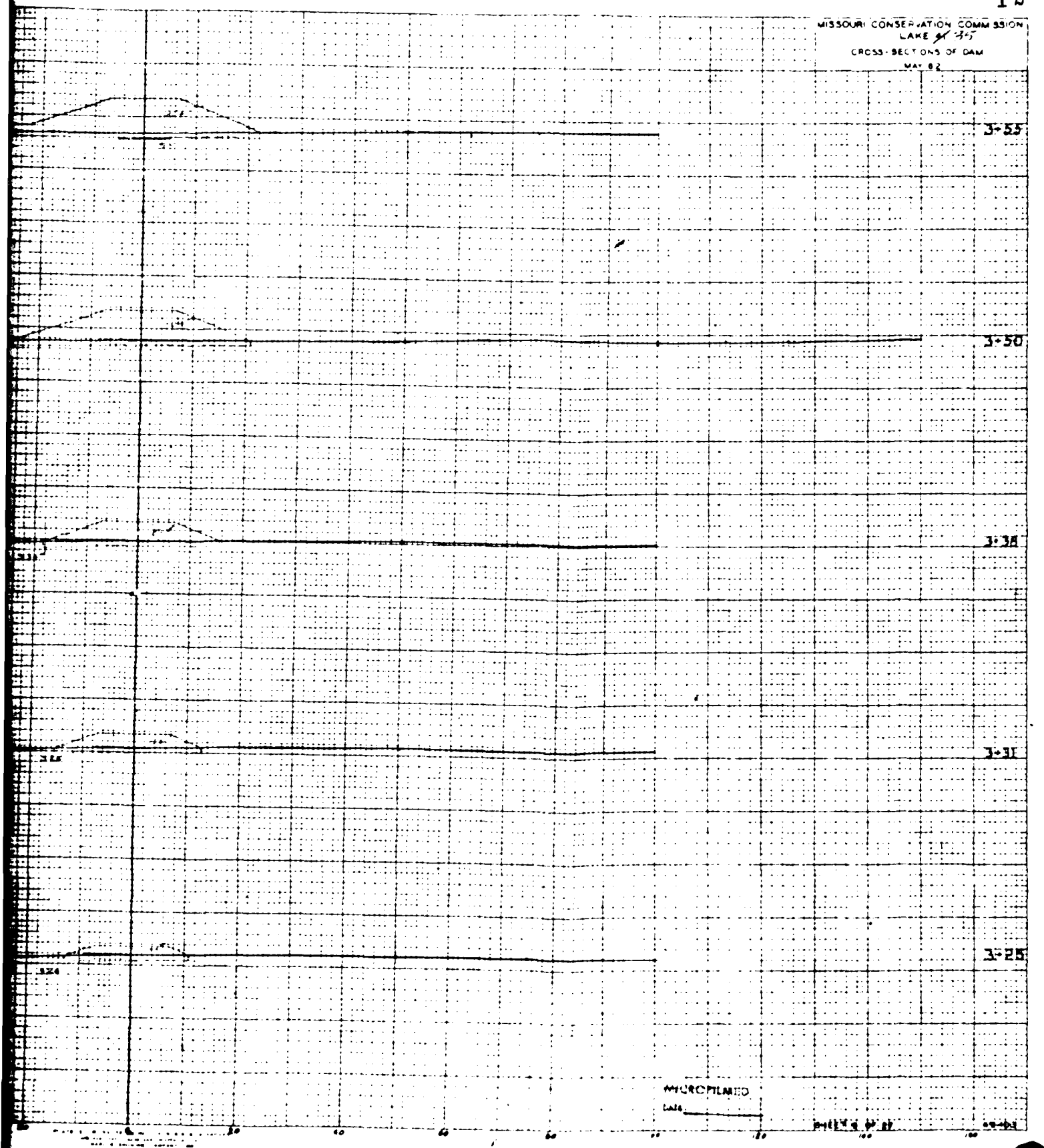

MISSOURI CONSERVATION COMMISSION
LAKE
MAY 82
MICROFILMED

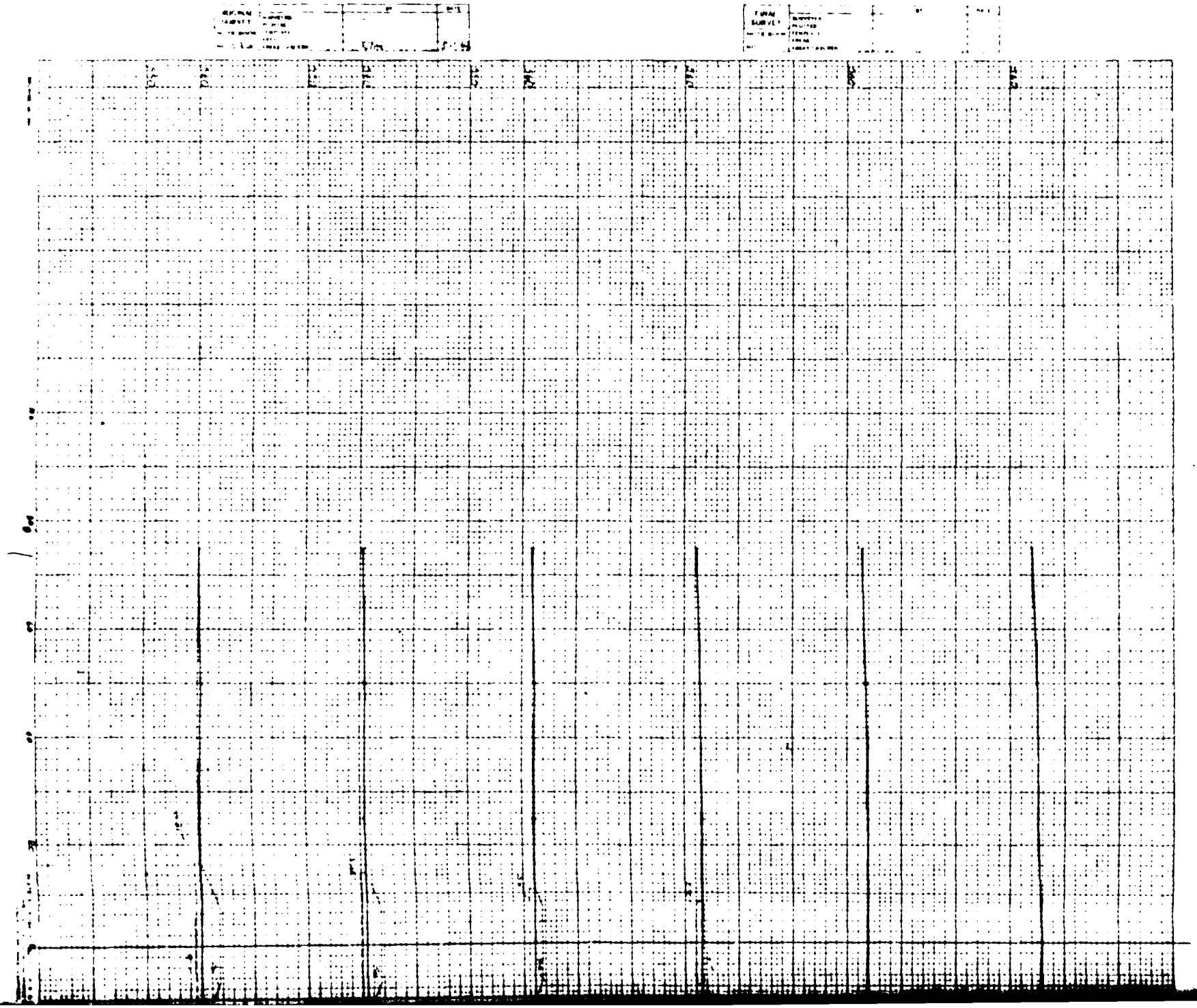
2

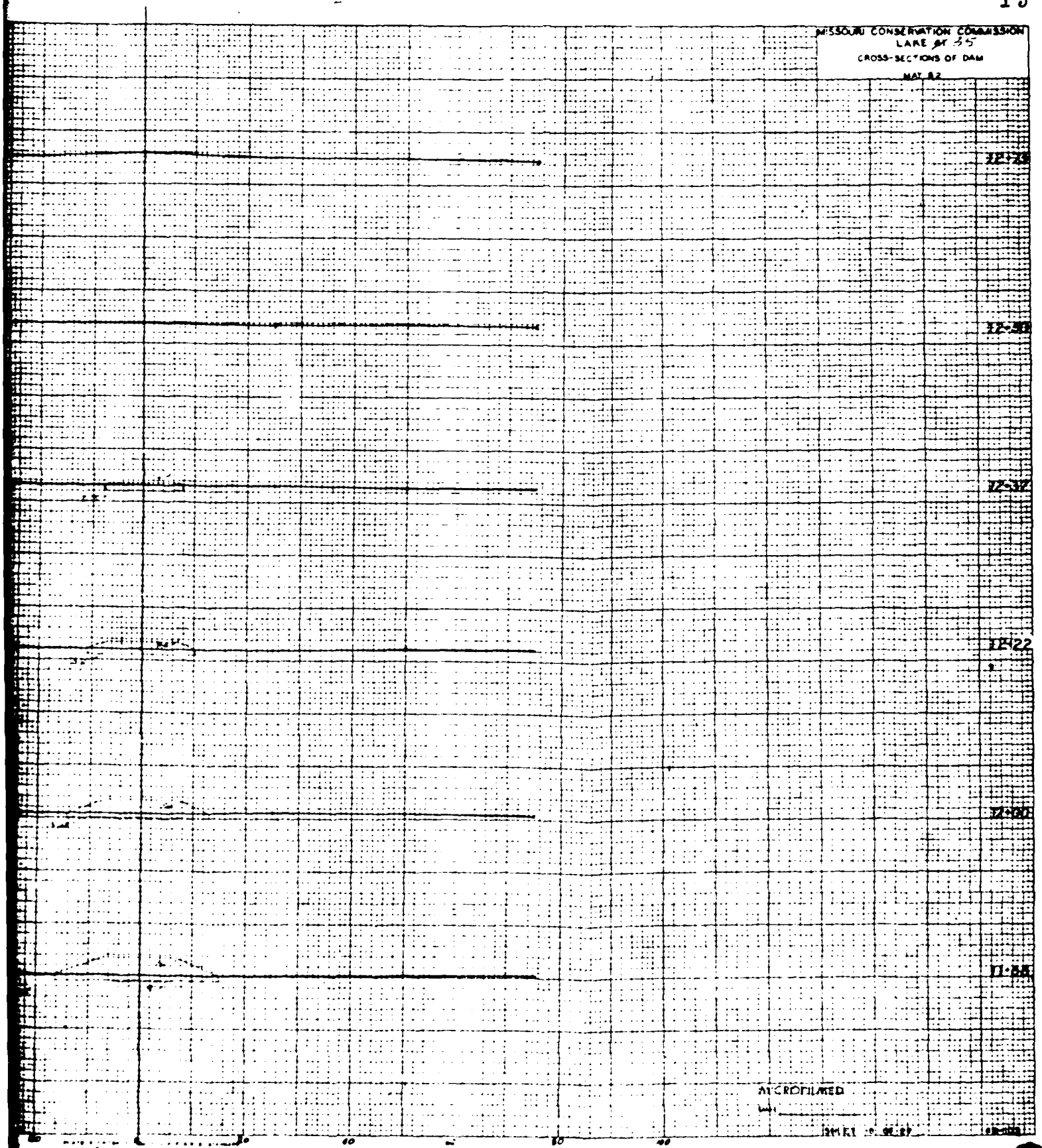


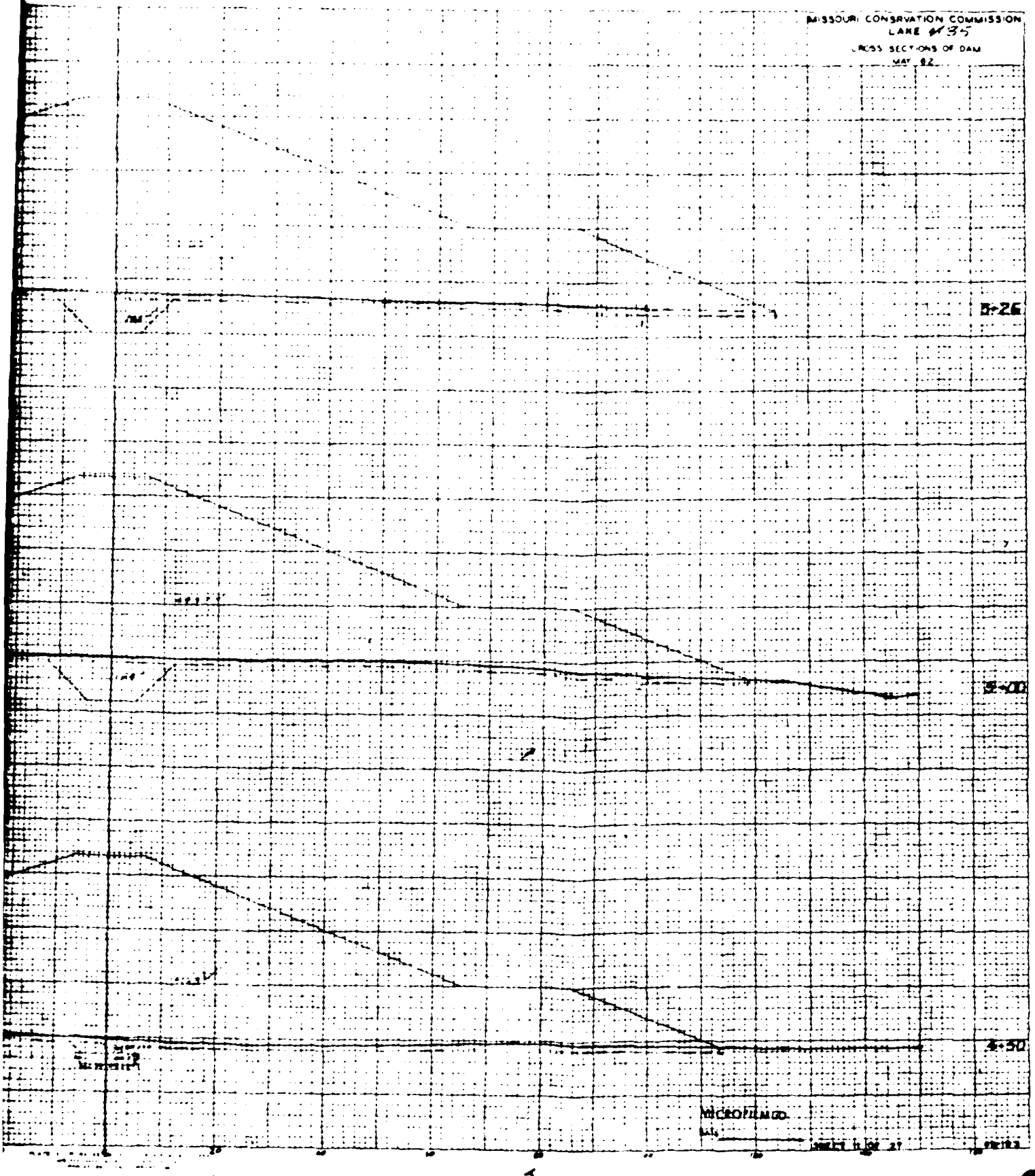

MISSOURI CONSERVATION COMMISSION
LAKE # 35
CROSS-SECTIONS OF DAM
MAY 82
3+15
3+09
3+00
2+50
2+00
MICROFILMED
DATE




MISSOURI CONSERVATION COMMISSION
LAKE
CROSS-SECTIONS OF DAM
MAY 82
3+55
3+50
3+38
3+31
3+25
MICROFILMED

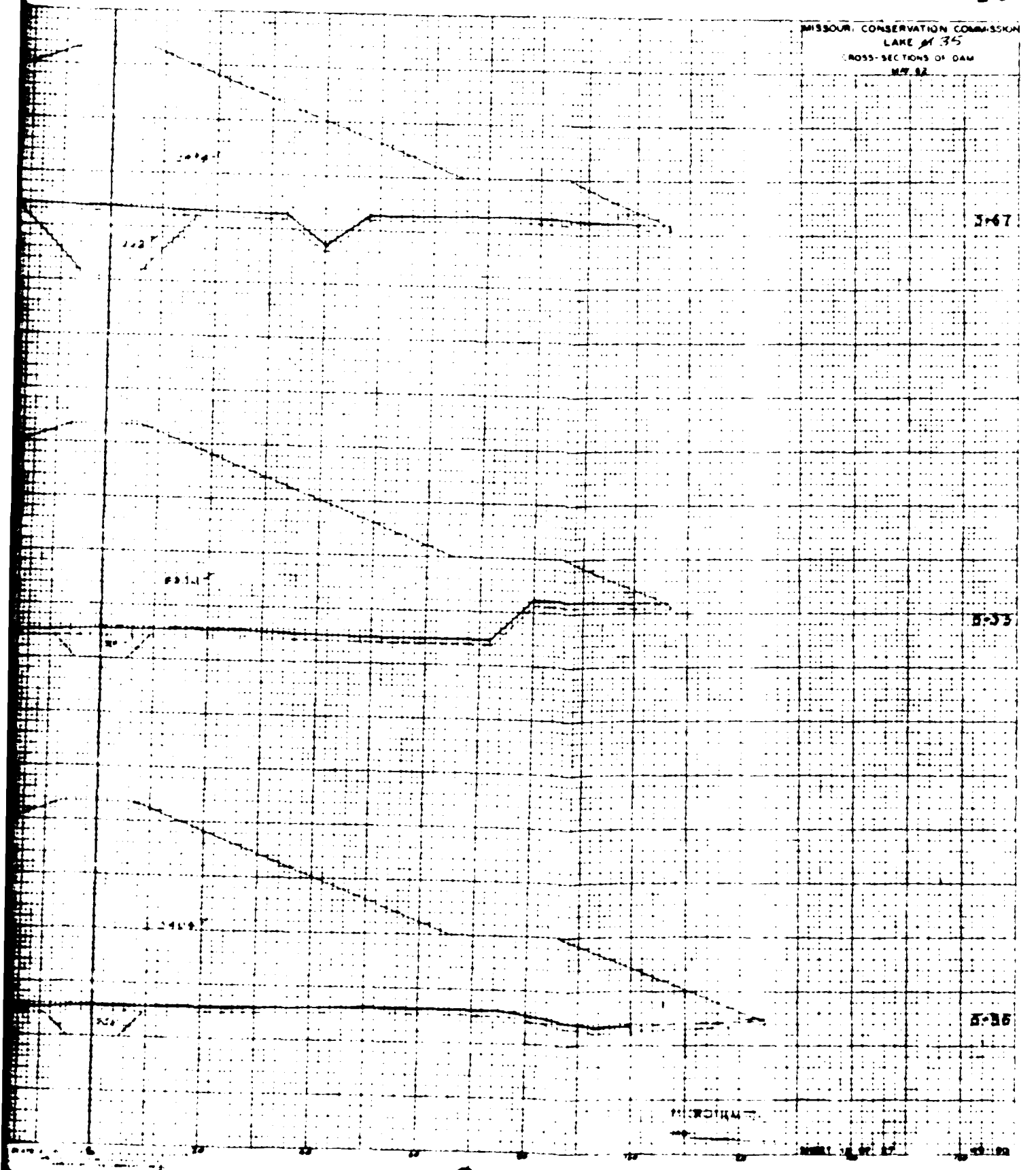



MISSOURI CONSERVATION COMMISSION
LAKE BY 35
CROSS-SECTIONS OF DAM
MAY 82
MICROFILMED


MISSOURI CONSRVATION COMMISSION
LAKE #35
CROSS SECTIONS OF DAM
MAY 82
5+26
5+00
4+50
MICROFILM CO.

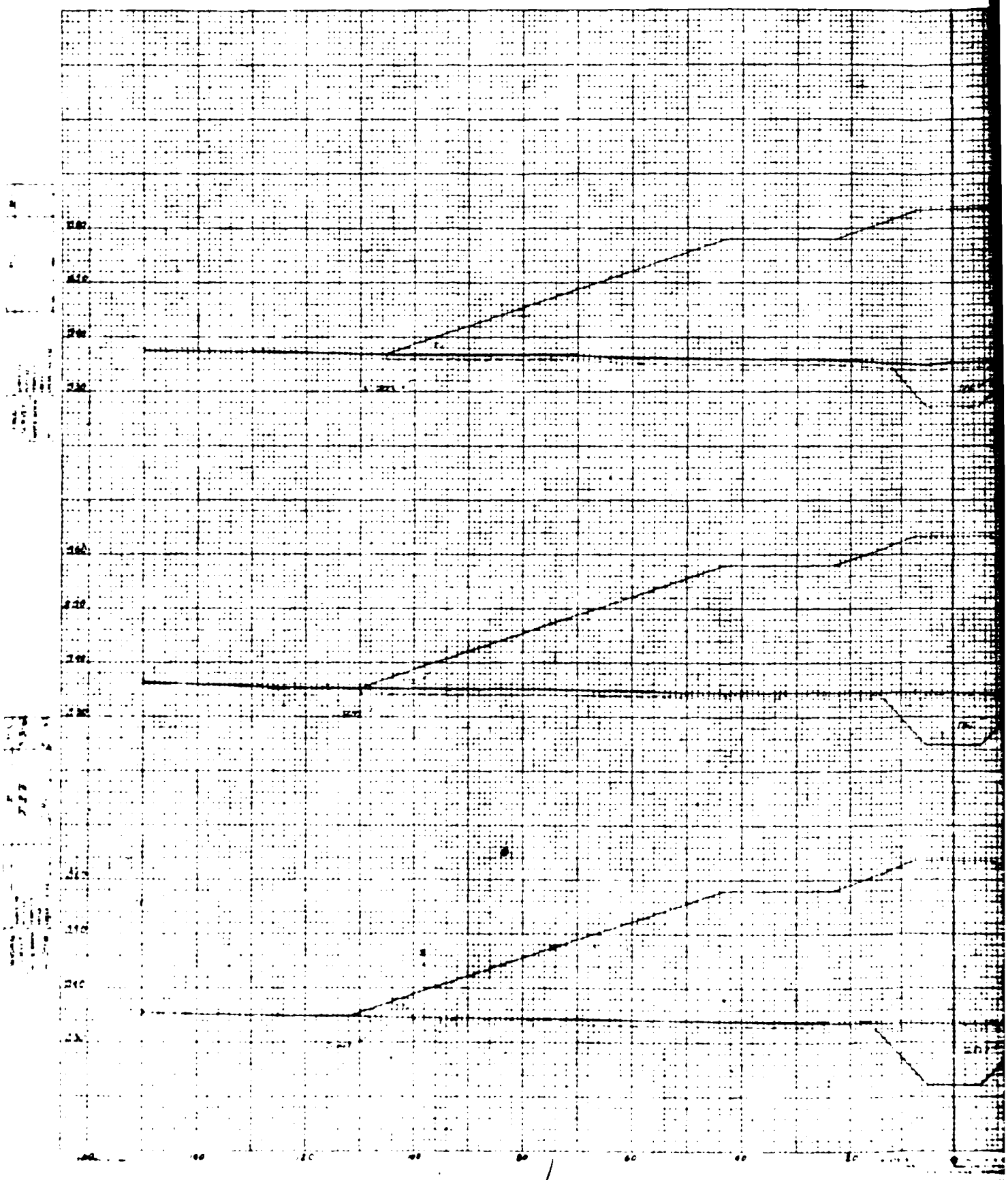
1 2

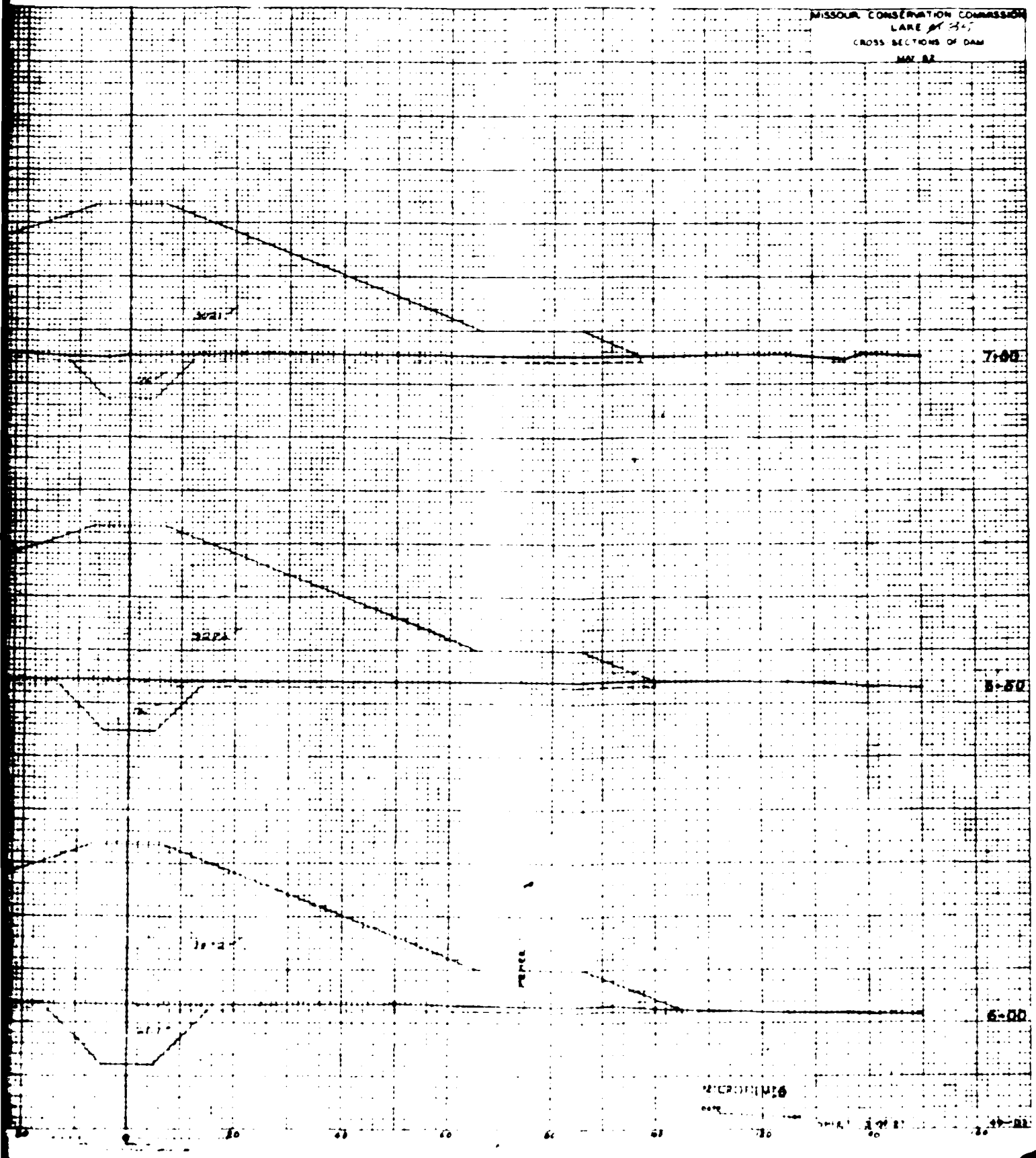

ORIGINAL SURVEY
FINAL SURVEY

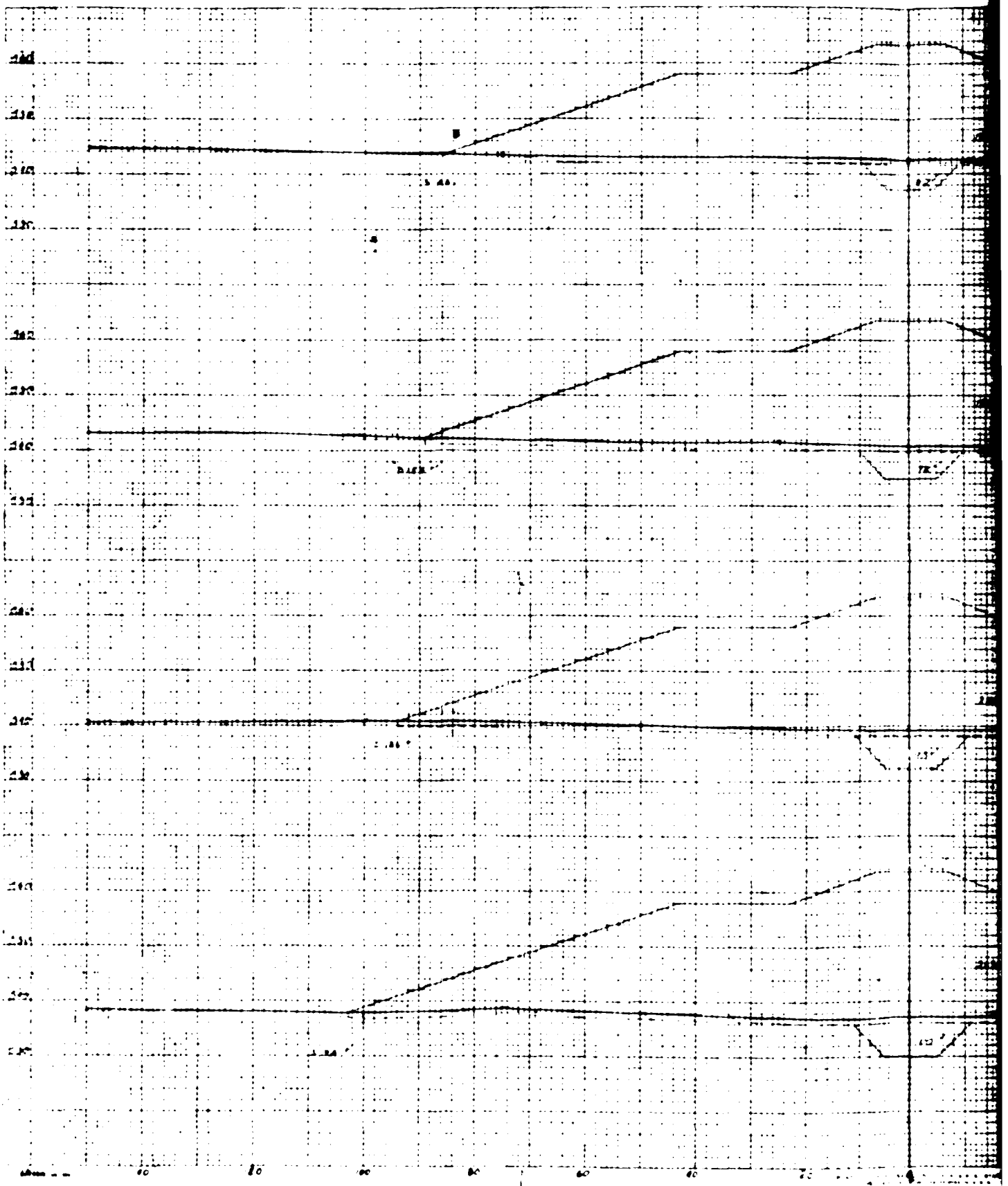

MISSOURI CONSERVATION COMMISSION
LAKE #35
CROSS-SECTIONS OF DAM
MAY 82
3+67
5+33
5+36

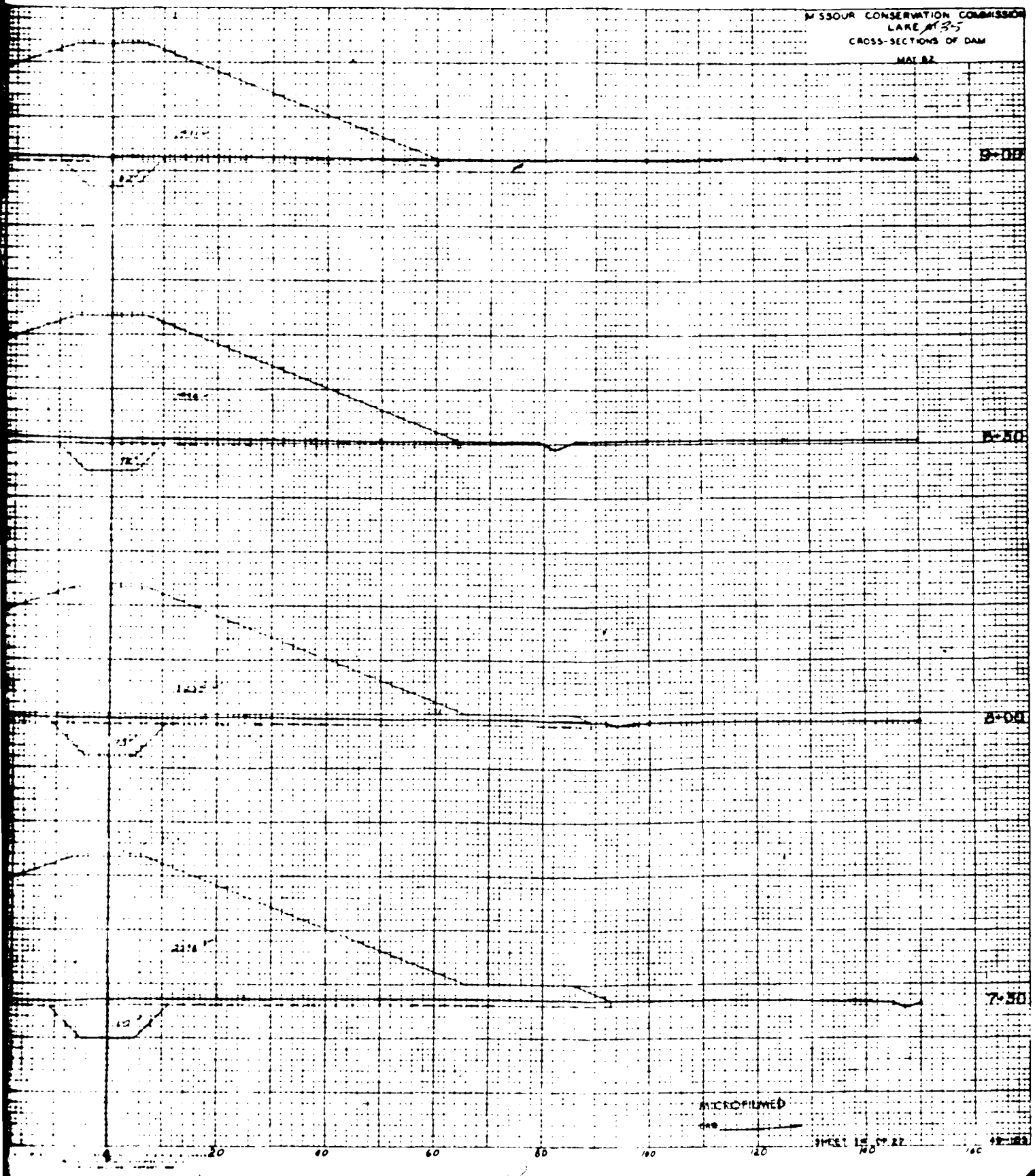
1

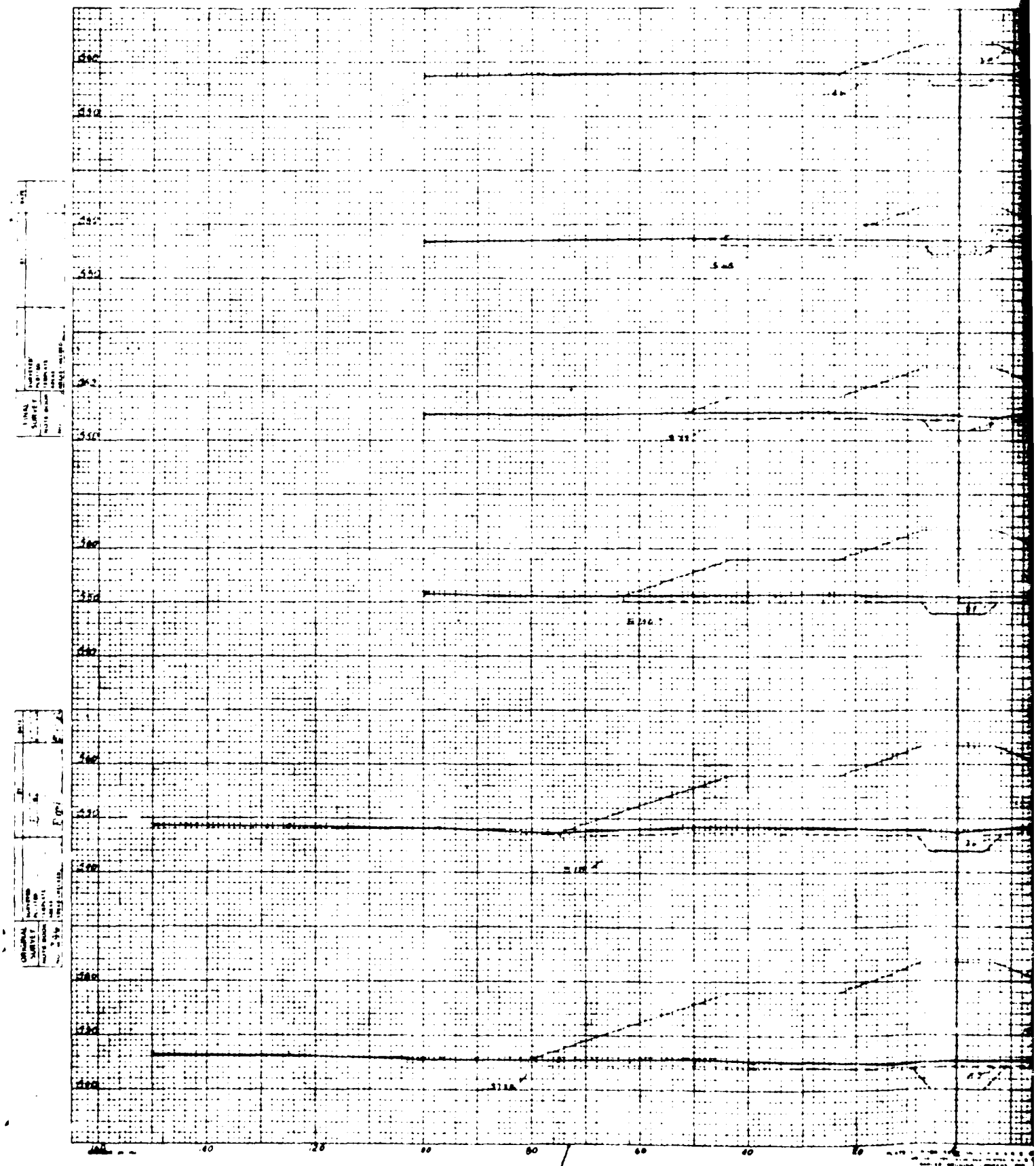
2




MISSOURI CONSERVATION COMMISSION
LAKE
CROSS SECTIONS OF DAM
MAY 82
7+00
5+50
6+00




MISSOUR CONSERVATION COMMISSION
LAKE
CROSS-SECTIONS OF DAM
MAY 82
9+00
8+50
8+00
7+50
20
40
60
80
100
120
140
160
MICROFILMED



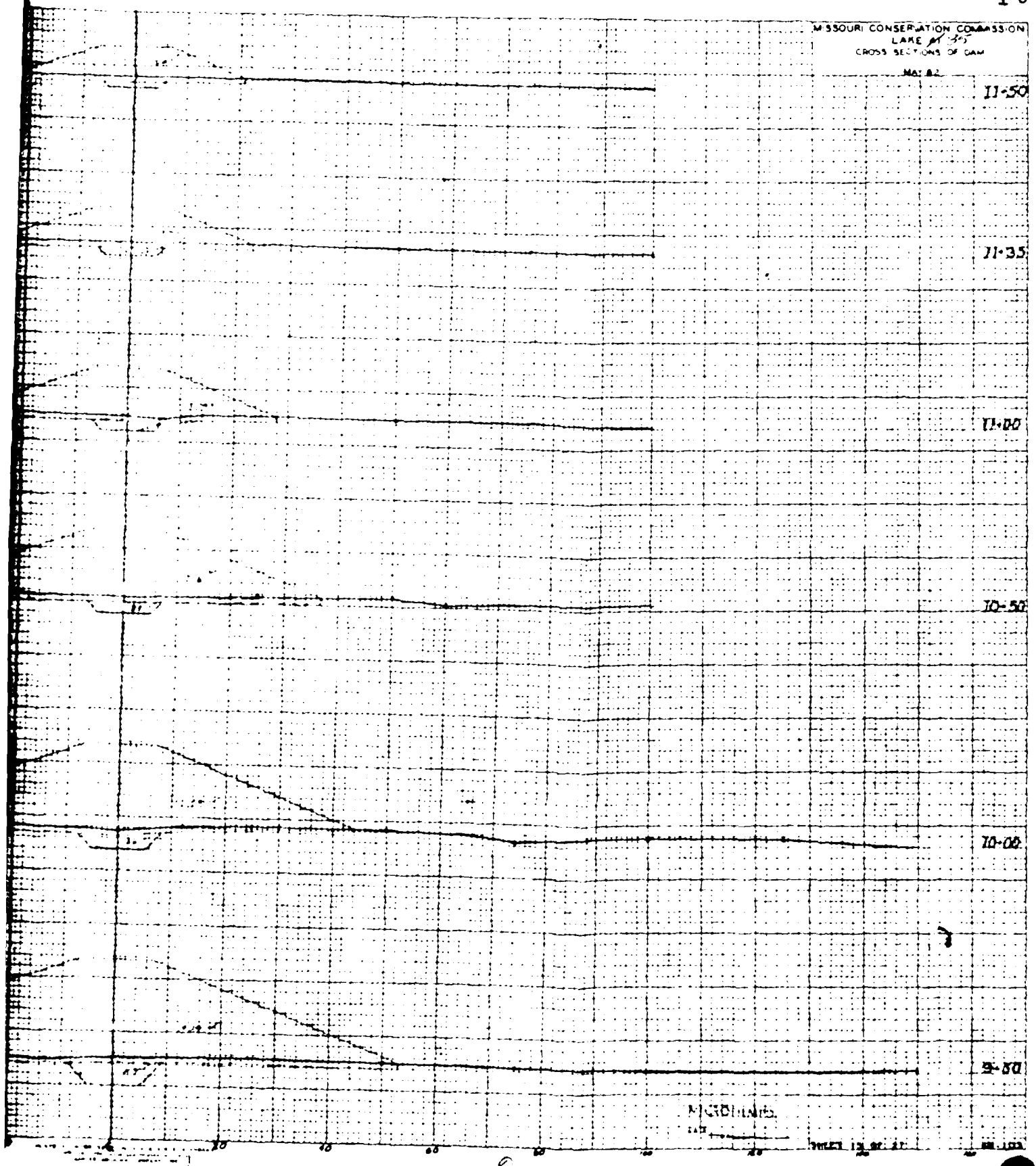
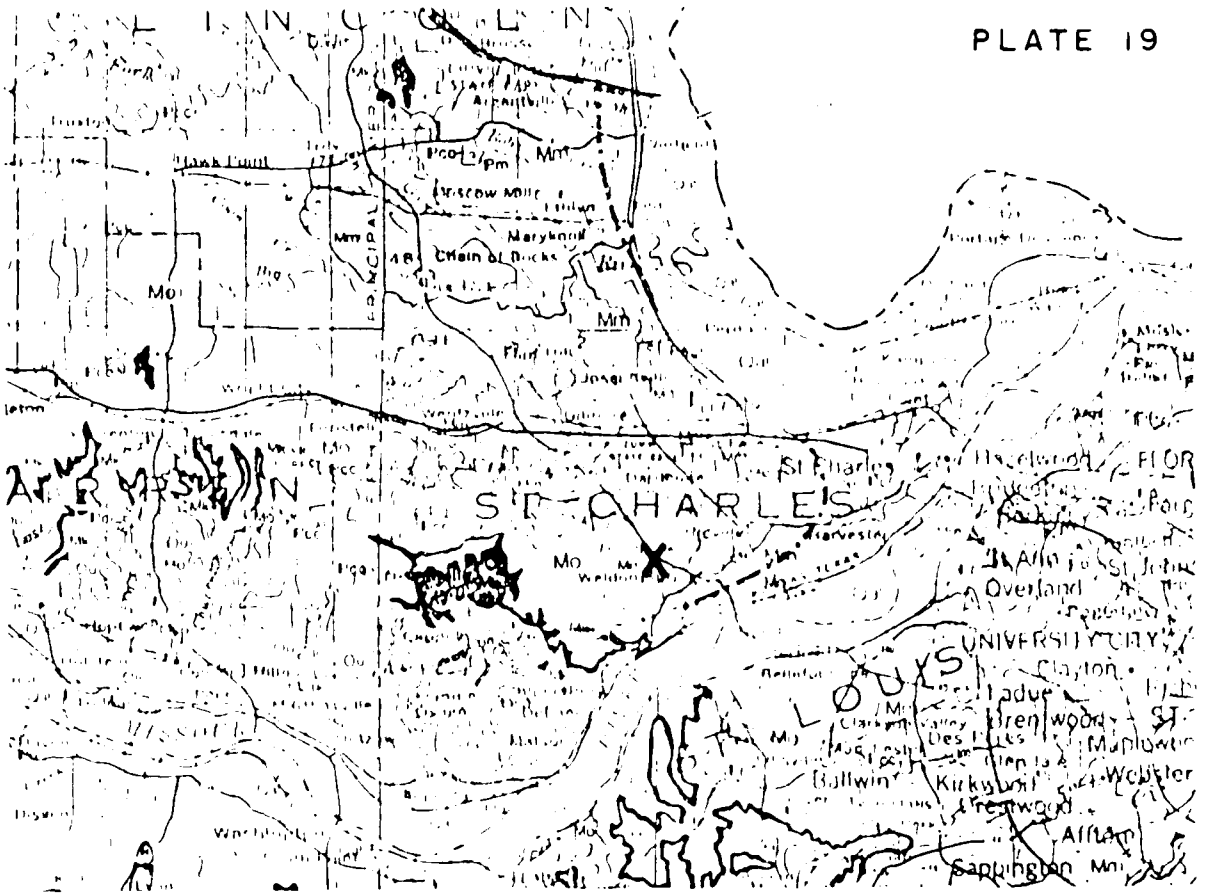

MISSOURI CONSERVATION COMMISSION
LAKE
CROSS SECTIONS OF DAM
11-50
11-35
11-00
10-50
10-00
9-50

PLATE 19



QUARTERNARY – Qal – ALLUVIAN

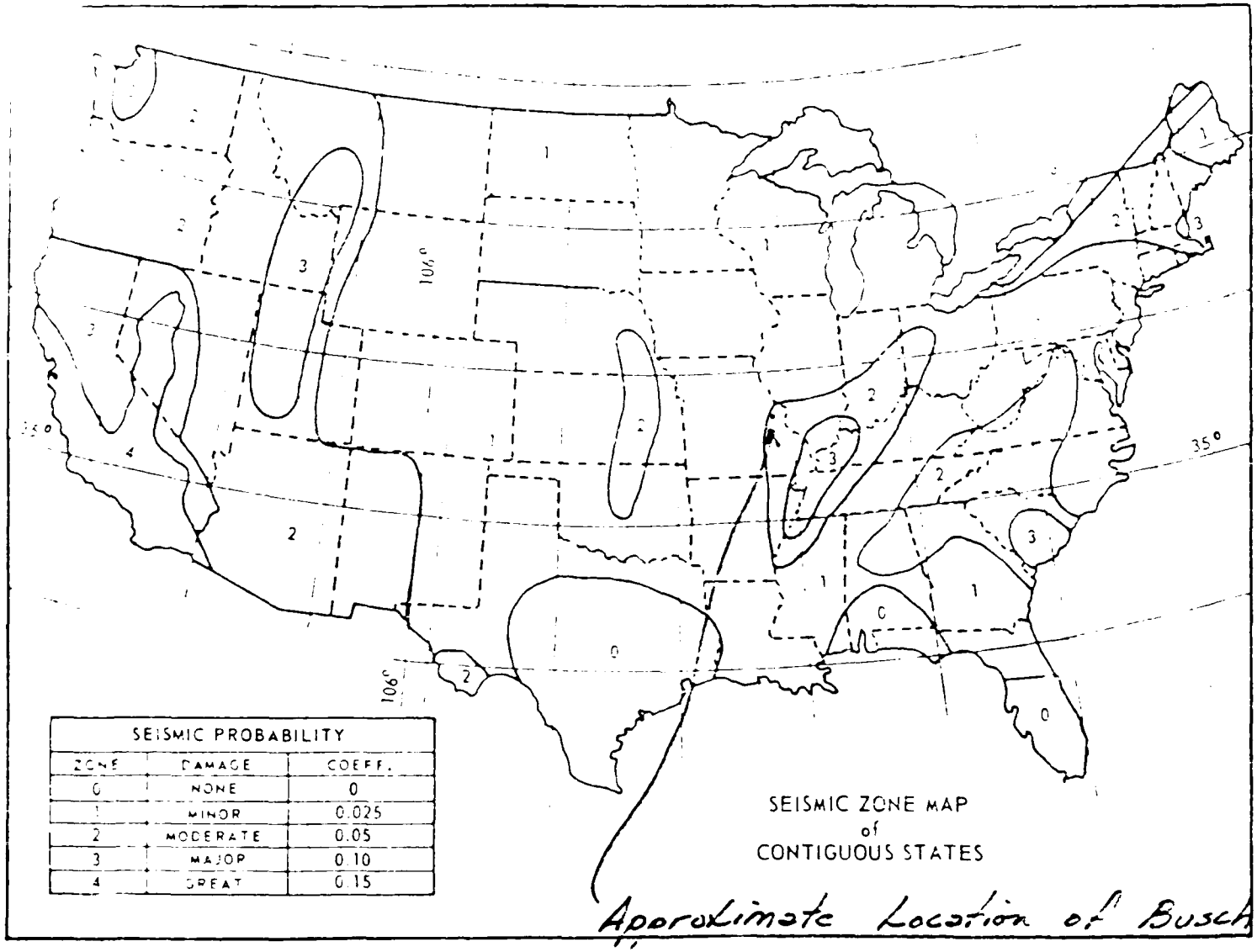
PENNSYLVANIAN – Pcc – CABINESS SUBGROUP

MISSISSIPPIAN
- Mm
  - STE. GENEVIEVE FORMATION
  - ST. LOUIS LIMESTONE
  - SALEM FORMATION
  - WARSAW FORMATION
- Mo
  - KEOKUK LIMESTONE
  - BURLINGTON LIMESTONE
  - FERN GLEN FORMATION

X – LOCATION OF DAM, MO. 10092

REFERENCE:
GEOLOGIC MAP OF MISSOURI
MISSOURI GEOLOGIC SURVEY
a) 1961 b) 1979

GEOLOGIC MAP OF ST. CHARLES COUNTY AND ADJACENT AREA



SEISMIC PROBABILITY		
ZONE	DAMAGE	COEFF.
0	NONE	0
1	MINOR	0.025
2	MODERATE	0.05
3	MAJOR	0.10
4	GREAT	0.15

Approximate Location of Busch Wildlife Area Lake #35 Dam.

PLATE 20

APPENDIX A

PHOTOGRAPHS TAKEN DURING INSPECTION

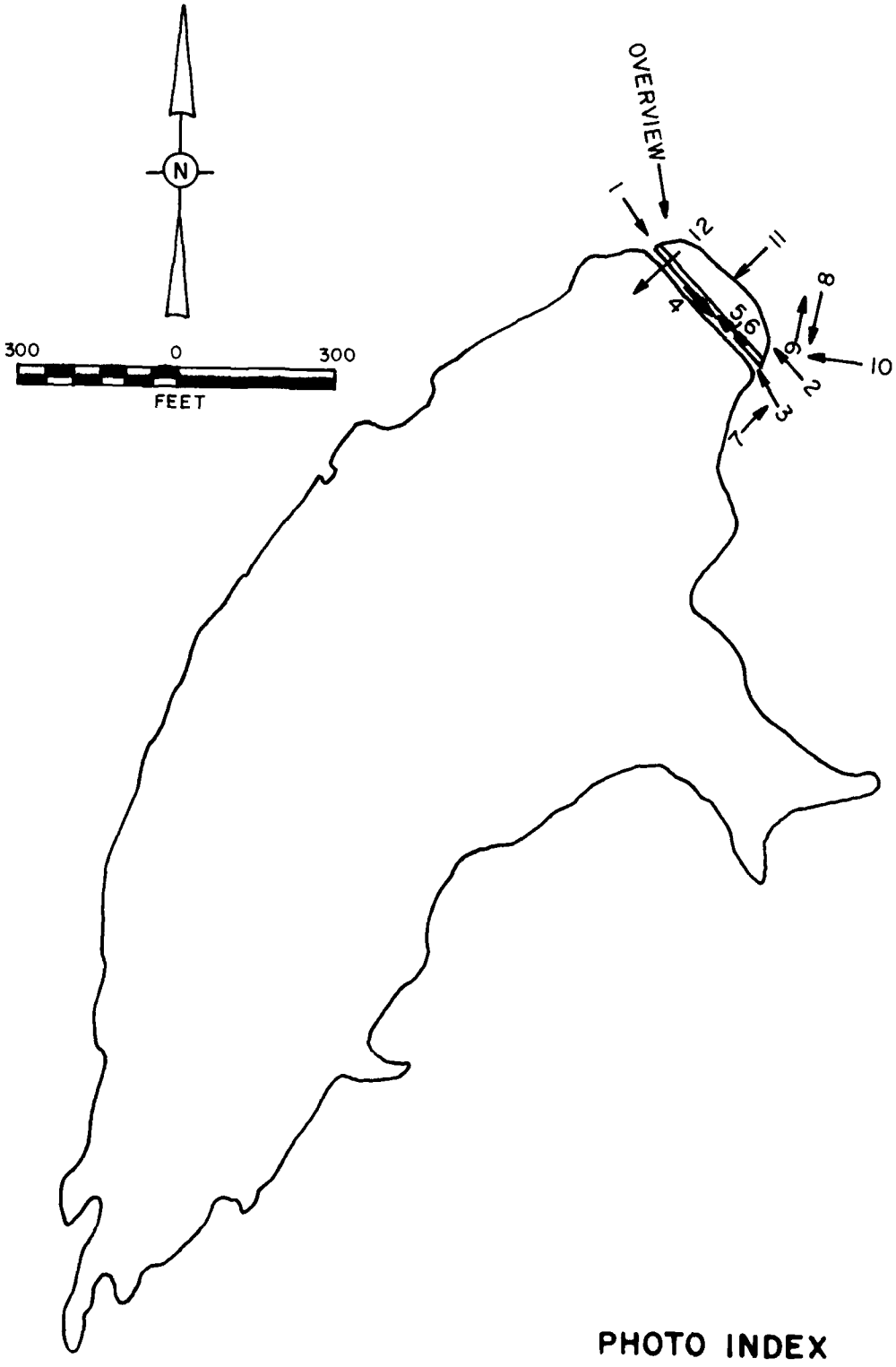


PHOTO INDEX
FOR
BUSCH WILDLIFE AREA LAKE NO. 35 DAM

Busch Wildlife Area Lake No. 35 Dam

Photo 1.	-	View of the crest of the embankment.
Photo 2.	-	View of the downstream embankment slope.
Photo 3.	-	View of the upstream embankment slope and berm.
Photo 4.	-	View of the erosion on the upstream embankment slope.
Photo 5.	-	View of the cracking on the upstream berm.
Photo 6.	-	View of the cracking on the upstream berm.
Photo 7.	-	View of the approach channel to the spillway. Note concrete weir in background.
Photo 8.	-	View of the discharge channel of the spillway and the weir.
Photo 9.	-	View of the discharge channel of the spillway.
Photo 10.	-	View of the erosion in the discharge channel.
Photo 11.	-	View of the outlet to the low level drain.
Photo 12.	-	View of the reservoir rim.

Busch Wildlife Area Lake No. 35 Dam

Photo 1

Photo 3

Photo 4

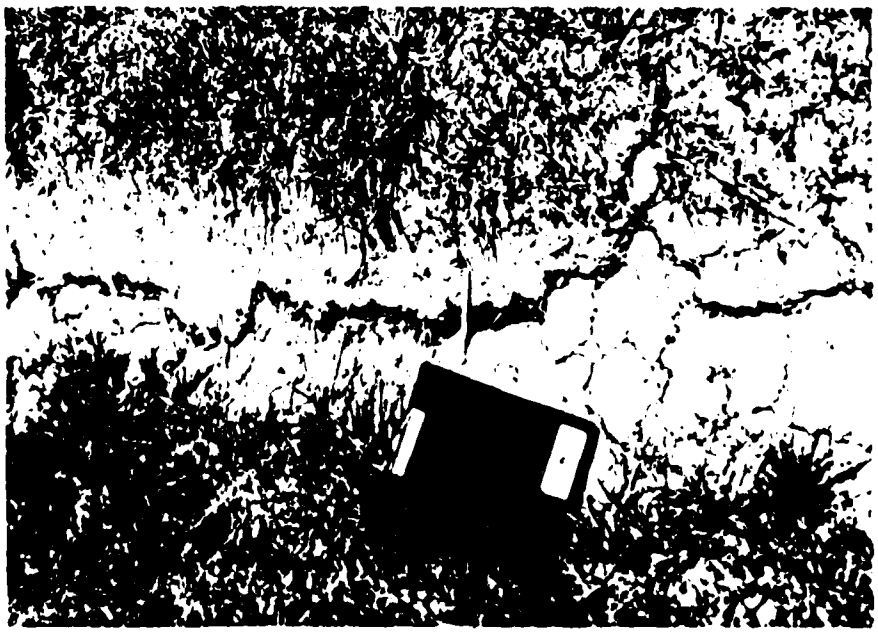


Photo 7

Photo 8

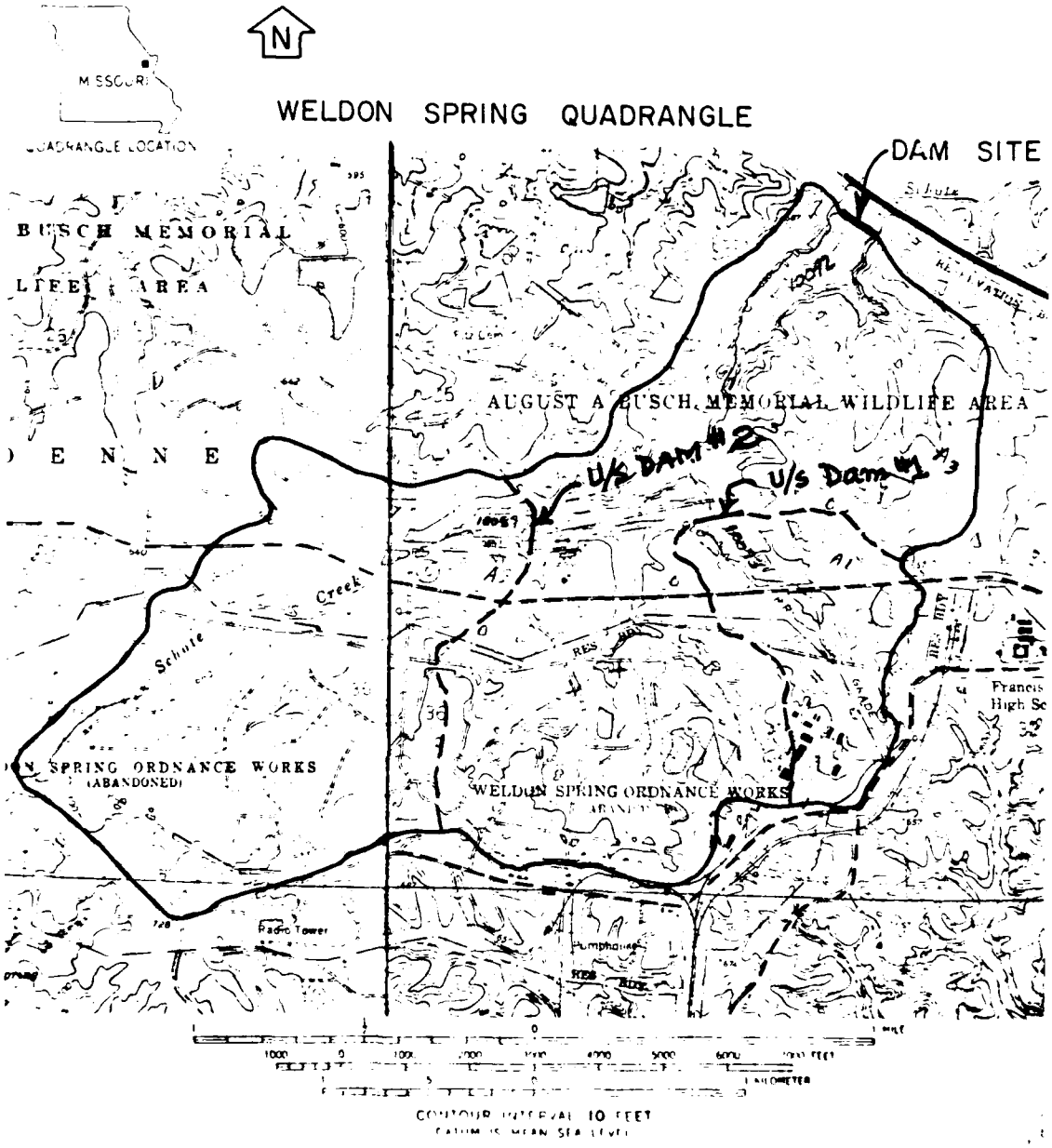
Photo 9

Photo 11

Photo 12

APPENDIX B

HYDROLOGIC COMPUTATIONS



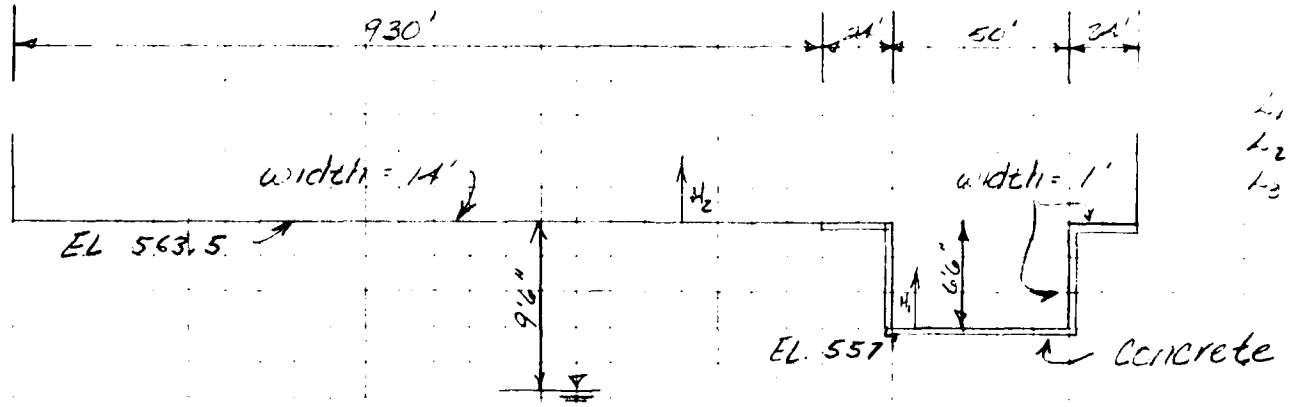
DRAINAGE BOUNDARY ————————

SUB DRAINAGE BOUNDARY - - - - - - - -

BUSCH WILDLIFE AREA LAKE DAM (MO 10092)
DRAINAGE BASIN

Dam Safety Inspection - Missouri
Beech Wildlife Area Lake No. 35 Dam - #10092
Spillway and Overtop Rating Curve

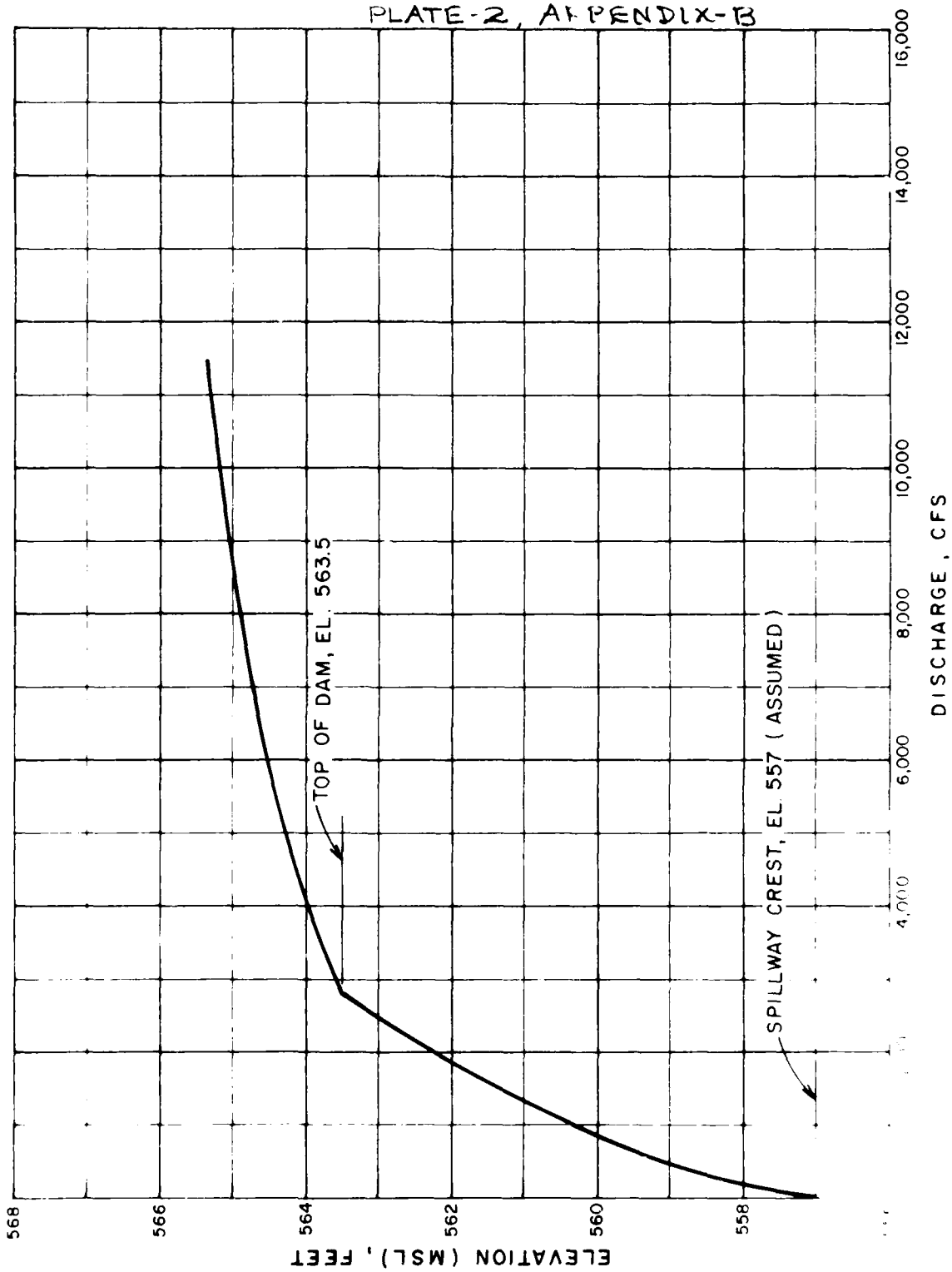
SHEET NO. ___ OF ___
JOB NO. 1340
BY dlj DATE 6/21/79
HB 6-77



L_1 = 50'
L_2 = 24 + 24 = 48'
L_3 = 930'

Reservoir Surface Elevation	C_1	L_1	H_1	Q_1 $(C_1 L_1 H_1^{3/2})$	C_2	L_2	H_2	Q_2 $(C_2 L_2 H_2^{3/2})$	C_3	L_3	H_3	Q_3 $(C_3 L_3 H_3^{3/2})$	Q_T $Q_1 + Q_2 + Q_3$
557	-	50	0	0	-	48	0	0	-	930	0	0	0
558	2.98		1.0	149	-				-				149
560	3.32		3.0	863	-				-				863
562			5.0	1856	-				-				1856
563.5			6.5	2751	-		0	0	-		0	0	2751
564			7.0	3074	2.73		0.5	46	2.70		0.5	888	4008
565			8.0	3756	3.24		1.5	2586	2.64		1.5	4510	8852
566			9.0	4482	3.31		2.5	6088	2.63		2.5	9668	14778
568			11.0	6056	3.32		4.5	15221	2.63		4.5	23348	30925

PLATE-2, APPENDIX-B



BUSCH WILDLIFE AREA LAKE NO 35 DAM M
SPILLWAY & OVERTOP RATING CURVE

AD-A106 862 PRC CONSOER TOWNSEND INC ST LOUIS MO F/G 13/13
NATIONAL DAM SAFETY PROGRAM. BUSCH WILDLIFE AREA LAKE NUMBER 35--ETC(U)
NOV 79 W G SHIFRIN DACW43-79-C-0075
UNCLASSIFIED NL

2 OF 2
AD
A106862

END
DATE
FILMED
12-81
DTIC

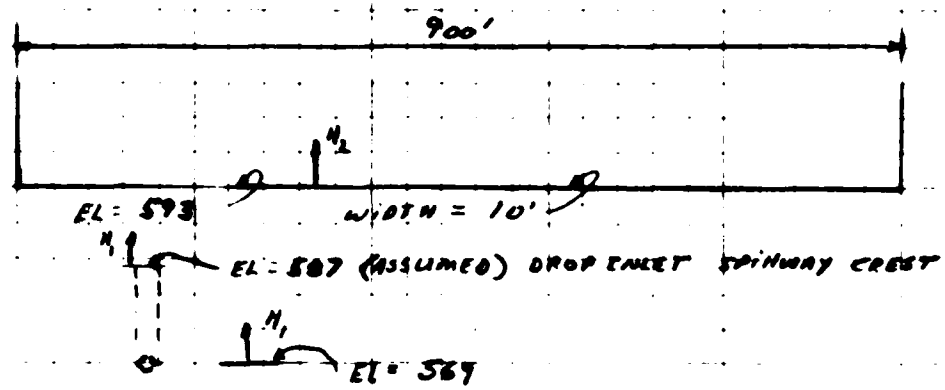
DAM SAFETY INSPECTION – MISSOURI

U/S DAM #1 (10093) TO BUSCH LAKE DAM #35

SPILLWAY AND OVERTOP RATING CURVE

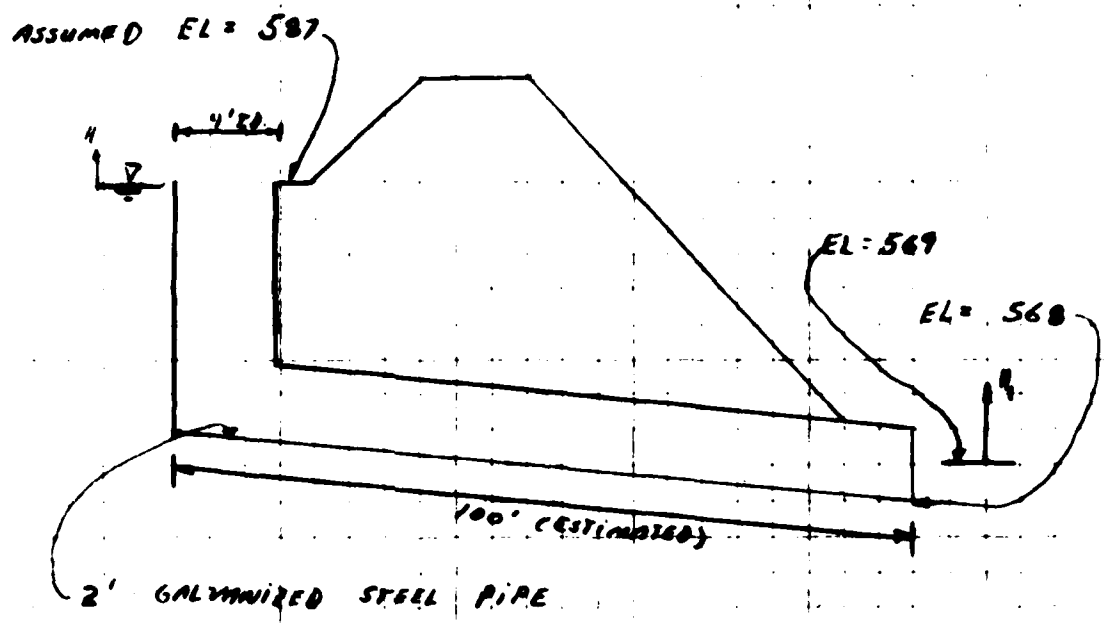
SHEET NO. 1 OF ___ JOB NO. 1240-001

BY HLB DATE 6-21-7



RESERVOIR WATER SURFACE ELEV.	H_1	PRINCIPLE SPILLWAY DISCHARGE $Q_1 = 13.90 H_1^{3/2}$	C_2	L_2	H_2	$Q_2 = C_2 L_2 H_2^{3/2}$	$Q_T = Q_1 + Q_2$
587	18	–	–	–	–	–	0
589	20	62	–	–	–	–	62
591	22	65	–		–	–	65
593	24	68	–	–	[illegible]	–	68
595	26	71	3.64	100	[illegible]	6720	6791
596	27	72	3.64	100	3	12346	12418

DAM SAFETY INSPECTION – MISSOURI SHEET NO. 2 OF
U/S DAM #1 (BUSCH 36) TO BUSCH LAKE DAM #35 JOB NO. 1240-001
PRINCIPLE SPILLWAY RATING CURVE BY MLB DATE 6-21-7.



ASSUME NO TAIL WATER EFFECTS.

AT WL = 589, H = 2

a) WEIR FLOW

$Q = CLH^{3/2} = 3.03 \times (\pi \times 4) \times 2^{3/2} = 108$ CFS.

b) PRESSURE FLOW

ASSUME $\epsilon = 0.017 \Rightarrow \epsilon/D = 0.00825 \Rightarrow f = 0.036$ & $K_e = 0.5$

$$H_T = \left(1.0 + K_e + f\,\frac{L}{D}\right)\frac{V^2}{2g}$$

$$H_T = \left(1.0 + 0.5 + 0.036\,\frac{100}{2}\right)\frac{V^2}{2g}$$

$$H_T = 3.30\,\frac{V^2}{2g}, \Rightarrow V = 4.42\sqrt{H_T}$$

ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION - MISSOURI SHEET NO. 3 OF

U/S DAM #1 (BUSCH 36) TO BUSCH LAKE DAM #35 JOB NO. 1240

PRINCIPLE SPILLWAY RATING CURVE BY HLB DATE 6-21-71

$$Q = A \cdot V = \pi \frac{D^2}{4} \times 4.42 \sqrt{H_T}$$

$$Q = 13.90 \sqrt{H_T}$$

$$H_T = 689 - 669 = 20$$

$$Q = 13.90 \sqrt{20} = \underline{62} \text{ CFS}$$

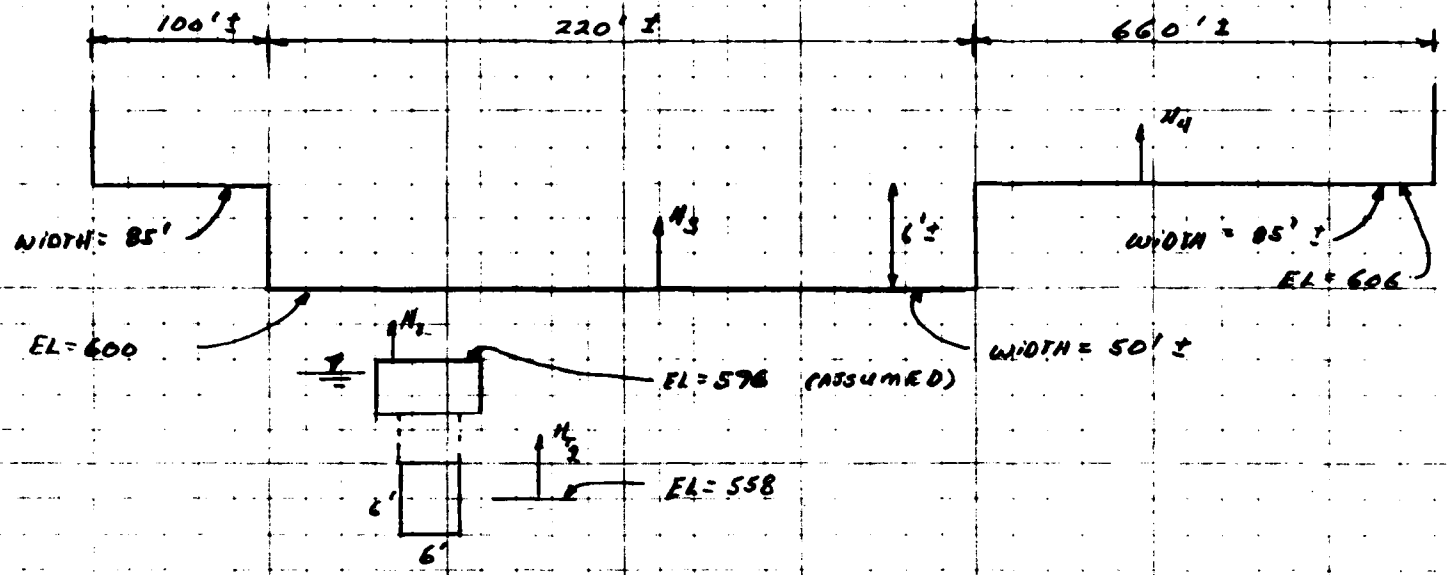
∴ AT ELEV 689 PRESSURE FLOW CONTROLS AND Q = 62 CFS

ALSO FOR ALL ELEVATIONS ABOVE 689 PRESSURE FLOW WILL CONTROL AND THE EQUATION $Q = 13.90 \sqrt{H_T}$ WILL BE USED.

DAM SAFETY INSPECTION — MISSOURI SHEET NO. ___ OF ___

U.S. DAM #2 (BUSCH 100089 LAKE) TO BUSCH LAKE #35 DAM JOB NO. 1240-001

SPILLWAY AND OVERTOP RATING CURVE. BY MLB DATE 6-22-7



RESERVOIR WATER SURFACE (ELEV.)	H_{T_2}	DROP INLET SPILLWAY DISCHARGE $Q_2 = 200.8\sqrt{H_{T_2}}$	C_3	L_3	H_3	$Q_3 = C_3 L_3 H_3^{3/2}$	C_4	L_4	H_4	$Q_4 = C_4 L_4 H_4^{3/2}$	$Q_T = Q_2 + Q_3 + Q_4$
596	38	—	—	—	—	—	—	—	—	—	0
598	40	653*	—	—	—	—	—	—	—	—	653
600	42	1301	—	—	0	—	—	—	—	—	1301
602	44	1337	2.63	220	2	1637	—	—	—	—	2969
604	46	1362	2.63	220	4	4629	—	—	—	—	5991
606	48	1391	2.63	220	6	8504	—	—	0	—	9895
607	9	1406	2.63	220	7	10,715	2.63	760	1	1999	14121

* WEIR FLOW CONTROLS

B-8

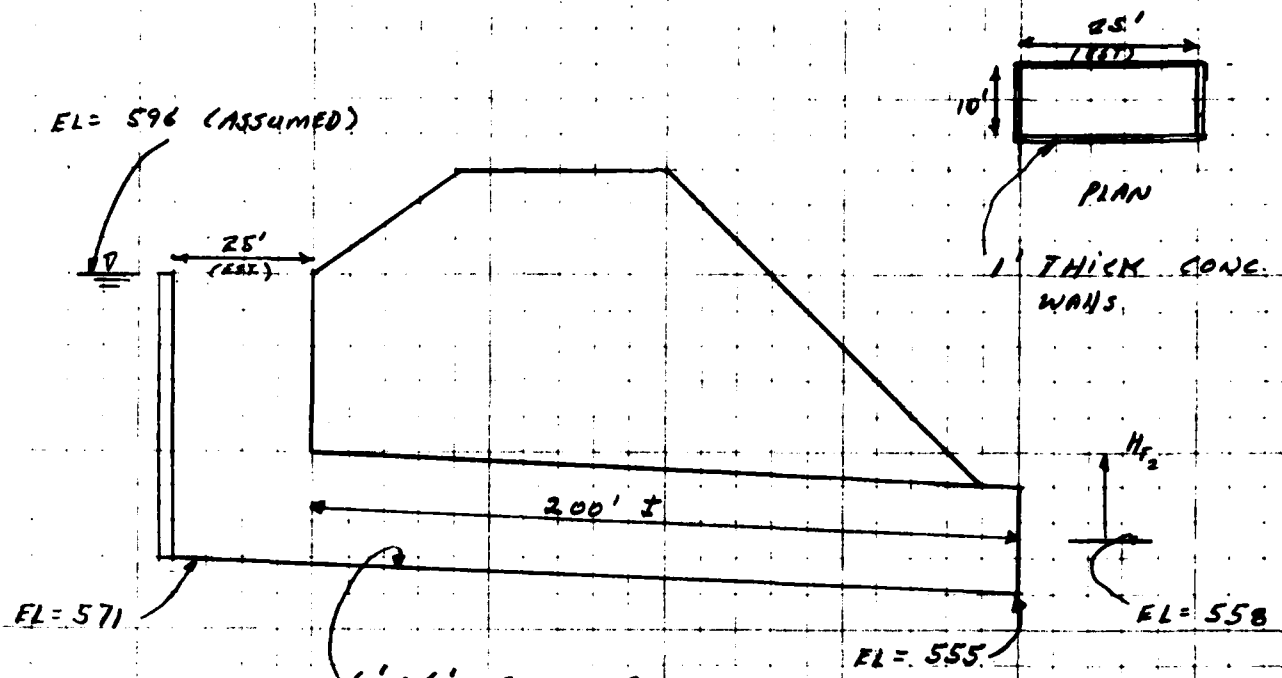
ECI-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION - MISSOURI SHEET NO. 2 OF

U/S DAM #2 (BUSCH AKA MEM. LAKE) TO BUSCH LAKE #85 DAM JOB NO. 1240-001

SPILLWAY RATING CURVE BY KLB DATE 6-23

✓ MAS



(ASSUME NO TAIL WATER EFFECTS.)

AT W.L. = 598

a) WEIR FLOW ASSUME C = 3.30

$L = (25+10) \times 2 = 70'$

$Q = CLH^{3/2}$

$H = 598 - 596 = 2'$

$Q = 3.3 \times 70 \times 2^{3/2} = \underline{653 \text{ CFS.}}$

b) PRESSURE FLOW

ASSUME $n = 0.013 \Rightarrow f = 0.017$ $K_e = 0.5$

$$H_{T_2} = \left(1.0 + 0.5 + f\,\frac{L}{D}\right)\frac{V^2}{2g}$$

$$H_{T_2} = \left(1.0 + 0.5 + 0.017 \frac{200}{4R}\right)\frac{v^2}{2g}$$

$$R = \frac{A}{P} = \frac{6 \times 6}{4 \times 6} = 1.5$$

$$H_{T_2} = \left(1.0 + 0.5 + 0.017 \frac{200 \times 4}{4 \times 1.5}\right)\frac{v^2}{2g}$$

$$H_{T_2} = 2.07 \frac{v^2}{2g}, \Rightarrow v = 5.58\sqrt{H_{T_2}}$$

$$Q_2 = A_2 V = (6 \times 6) \times 5.58\sqrt{H_{T_2}} = 200.8\sqrt{H_{T_2}}$$

$$H_{T_2} = 598 - 558 = 40'$$

$$Q_2 = 200.8\sqrt{40} = \underline{1270 \text{ CFS}} < 653 \text{ CFS}$$

$\therefore$ AT ELEV = 598 WEIR FLOW CONTROLS AND $Q_2 = 653$ CFS.

At W.L. = 600

a) Weir flow: $Q = 3.3 \times 70 \times 4^{3/2} = 1848$ cfs.

b) Pressure flow:

$$Q = 200.8\sqrt{42} = 1301 \text{ cfs}$$

Pressure flow controls:

Thus $Q = 1301$ cfs.

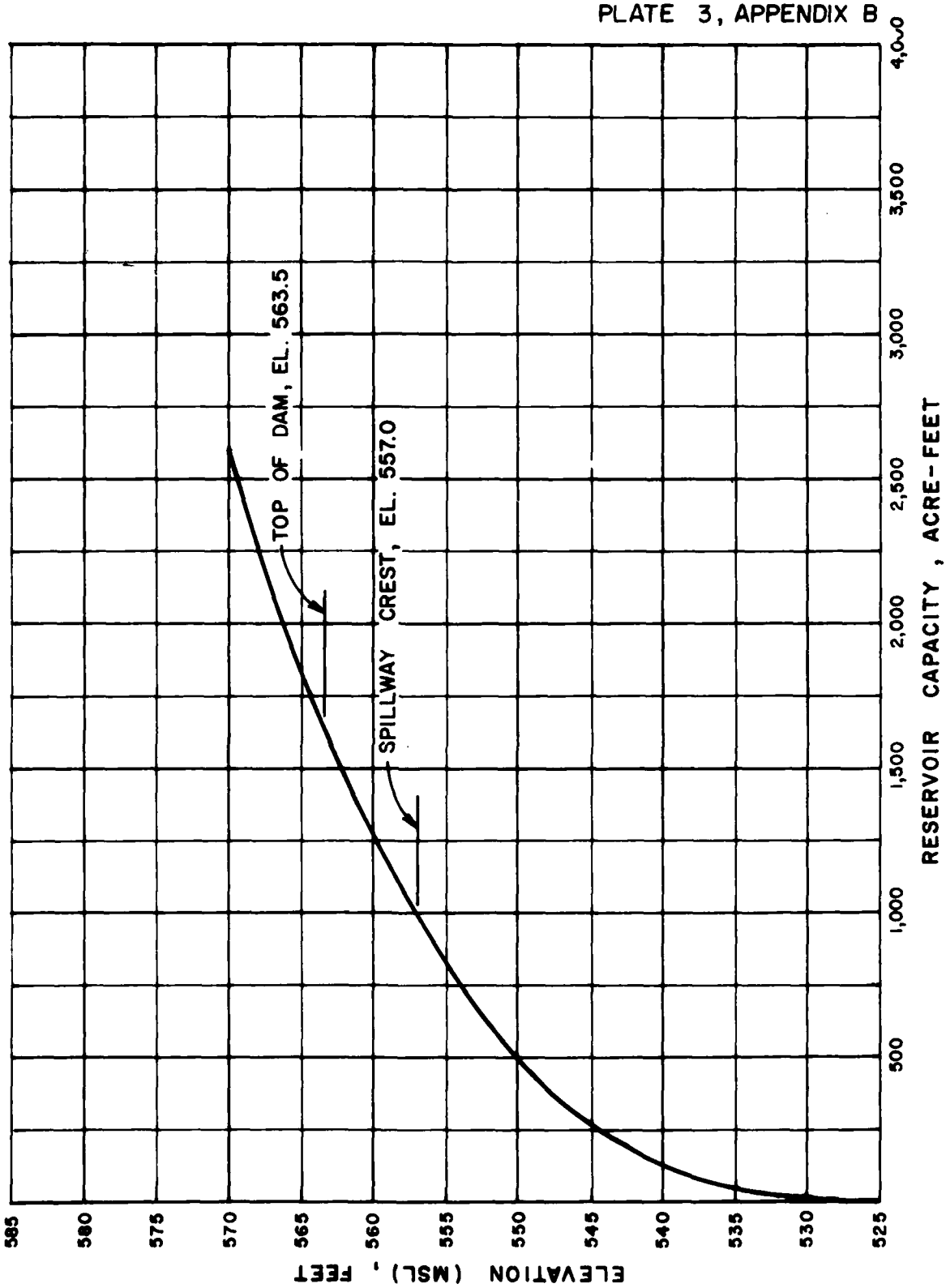
Use $Q = 200.8\sqrt{H_{T_2}}$ for water levels above 600.

DAM SAFETY INSPECTION - MISSOURI SHEET NO. 1 OF
BUSCH WILDLIFE AREA NO 35 LAKE DAM JOB NO. 1240-001
RESERVOIR AREA CAPACITY BY KLB DATE 6-26-7

BUSCH WILDLIFE AREA NO 35 LAKE DAM

RESERVOIR AREA CAPACITY

ELEV. M.S.L. (FT.)	RESERVOIR SURFACE AREA (ACRES)	INCREMENTAL VOLUME (AC-FT)	TOTAL VOLUME (AC-FT)	REMARKS
525	0	—	0	ASSUMED STREAM BED ELEV. ON U/S SIDE OF DAM
540	25	125.0	125.0	AREA MEASURED ON U.S.G.S. MAP
550	55	390.3	515.0	AREA MEASURED ON U.S.G.S MAP
557	85	486.2	1001.0	SPILLWAY CREST EL. (FROM PLANS)
560	98	274.3	1275.0	AREA MEASURED ON U.S.G.S. MAP
563.5	121	382.5	1658.0	TOP OF DAM EL.
570	169	938.2	2596.0	AREA MEASURED ON U.S.G.S. MAP.



BUSCH WILDLIFE AREA NO. 35 LAKE DAM (MO. 10092)
RESERVOIR CAPACITY CURVE

DAM SAFETY INSPECTION - MISSOURI SHEET NO. 1 OF
U/S DAM #1 (10093) TO BUSCH #35 LAKE DAM JOB NO. 1240-001-1
RESERVOIR AREA CAPACITY BY ALB DATE 6-27-79

U/S DAM 10093 TO BUSCH #35 LAKE DAM

RESERVOIR AREA CAPACITY

ELEV. M.S.L. (Ft)	RESERVOIR SURFACE AREA (ACRES.)	INCREMENTAL VOLUME (AC-FT)	TOTAL VOLUME (AC-FT)	REMARKS
568	0	–	0	EST. STREAM INVERT ELEVATION AT CENTER OF DAM
580	5	20	20	
587	15	67	87	ASSUMED W.S. ELEV. ON U.S.G.S MAP. ASSUMED DROP INLET SPILLWAY CREST ELEV.
593	23	113	200	TOP OF DAM ELEV. (ESTIMATED)
600	31	188	388	
610	65	470	858	

U/S DAM 10089 TO BUSCH #35 LAKE DAM

RESERVOIR AREA CAPACITY

ELEV. M.S.L. (FT.)	RESERVOIR SURFACE AREA (ACRES)	INCREMENTAL VOLUME (AC-FT)	TOTAL VOLUME (AC-FT)	REMARKS.
580	0	—	0	EST. STREAM CENTER LINE ELEV. AT BOTTOM OF DAM
596	13	69	69	ASSUMED W.S. ELEV. ON U.S.G.S. MAP. ASSUMED DROP INLET SPILLWAY CREST ELEV.
600	22	69	138	EMERGENCY SPILLWAY CREST ELEV. (EST.)
606	39	181	319	TOP OF DAM ELEV. (EST)
610	56	189	508	

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DAM SAFETY INSPECTION – MISSOURI — SHEET NO. 1 OF

BUSCH WILDLIFE AREA #35 LAKE DAM (10092) — JOB NO. 1240-001

UNIT HYDROGRAPH PARAMETERS — BY KLB DATE 6-28-7

1. DRAINAGE AREA, $A = 1070$ AC $= 1.67$ SQ. MI.

2. LENGTH OF STREAM $= L = 4.5'' \times 2000' = 9000' = 1.70$ MI

3. ELEVATION AT DRAINAGE DIVIDE ALONG THE LONGEST STREAM $= H_1 = 685$

4. RESERVOIR ELEVATION AT SPILLWAY CREST $= H_2 = 557$

5. DIFFERENCE IN ELEVATION $= \Delta H = 685 - 557 = 128$ FT

6. AVERAGE SLOPE OF STREAM $= \frac{\Delta H}{L} = \frac{128}{9000} = 1.42\%$

7. TIME OF CONCENTRATION:

a) BY KIRPICH FORMULA:

$$T_c = \left(\frac{11.9 \times L^3}{\Delta H}\right)^{0.385} = \left(\frac{11.9 \times 1.70^3}{128}\right)^{0.385}$$

$$T_c = 0.74 \text{ HR}$$

b) BY VELOCITY ESTIMATE: AVG VEL = 2 FPS

$$T_c = \frac{L}{V} = \frac{9000}{2 \times 3600} = 1.25 \text{ HR}$$

USE $T_c = 0.8$ HR.

8. LAG TIME $= 0.6 \times T_c = 0.6 \times 0.8 = \underline{0.48}$ HR

9. UNIT DURATION, $D \leq \frac{L_t}{3} = \frac{0.48}{3} = 0.16 > 0.083$

USE $D = 0.083$ HR. $= 5$ MIN.

10. TIME TO PEAK, $T_p = \frac{D}{2} + L_t = \frac{0.083}{2} + 0.48$

$T_p = \underline{0.52}$ HR.

11. PEAK DISCHARGE, $q_p = \frac{484 \times A}{T_p} = \frac{484 \times (1.67)}{0.52}$

$q_p = \underline{1554 \text{ CFS}}$

ECI-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION – MISSOURI SHEET NO. 1 OF

U/S DAM 10093 TO BUSCH WILDLIFE AREA LAKE #35 (10092) JOB NO. 1240-001

UNIT OF HYDROGRAPH PARAMETERS BY KLB DATE 6-28-79

1. DRAINAGE AREA, A = 228 AC = 0.36 SQ. MI.

2. LENGTH OF STREAM, L = 2.8" x 2000' = 5600' = 1.06 MI

3. ELEVATION AT DRAINAGE DIVIDE ALONG THE LONGEST STREAM = H_1 = 642

4. RESERVOIR ELEVATION AT SPILLWAY CREST = H_2 = 587

5. DIFFERENCE IN ELEVATION, ΔH = 55 Ft

6. AVERAGE SLOPE OF STREAM = $\frac{\Delta H}{L} = \frac{55}{5600} = 0.98\%$

7 TIME OF CONCENTRATION:

a) BY KIRPICH FORMULA:

$$T_c = \left(\frac{11.9 \times L^3}{\Delta H}\right)^{0.385} = \left(\frac{11.9 \times 1.06^3}{55}\right)^{0.385}$$

T_c = 0.59 HR

b) BY VELOCITY ESTIMATE: AVG VEL = 2 FPS

$$T_c = \frac{L}{V} = \frac{5600}{2 \times 3600} = 0.78 \text{ HR}$$

USE T_c = 0.6 HR

8 LAG TIME = $0.6 \times T_c = 0.6 \times 0.6 = \underline{0.36}$ HR

9 UNIT DURATION, $D \leq \frac{L_t}{3} = \frac{0.6}{3} = 0.2 \not> 0.083$

USE D = 0.083 HR = 5 MIN.

10. TIME TO PEAK, $T_p = \frac{D}{2} + L_t = \frac{0.083}{2} + 0.36 = \underline{0.40 \text{ HR}}$

11. PEAK DISCHARGE, $q_p = \frac{484 \cdot A}{T_p} = \frac{484 \times (0.36)}{0.40}$

$q_p = \underline{436}$ CFS

DAM SAFETY INSPECTION – MISSOURI SHEET NO. 1 OF

U/S DAM #10089 TO BUSCH WILDLIFE AREA LAKE #35 (10092) JOB NO. 1290-001

UNIT HYDROGRAPH PARAMETERS BY KLB DATE 6-28-79

1. DRAINAGE AREA, $A = 809$ AC $= 1.26$ SQ. MI.

2. LENGTH OF STREAM, $L = 4'' \times 2000' = 8000' = 1.52$ MI

3. ELEVATION AT DRAINAGE DIVIDE ALONG THE LONGEST STREAM $= H_1 = 708$

4. RESERVOIR ELEVATION AT SPILLWAY CREST $= H_2 = 596$

5. DIFFERENCE IN ELEVATION, $\Delta H = 112$ FT

6. AVERAGE SLOPE OF STREAM $= \frac{\Delta H}{L} = \frac{112}{8000} = 1.4\%$

7. TIME OF CONCENTRATION:

a) BY KIRPICH FORMULA:

$$T_c = \left(\frac{11.9 \times L^3}{\Delta H}\right)^{0.385} = \left(\frac{11.9 \times 1.52^3}{112}\right)^{0.385}$$

$$T_c = 0.68 \text{ HR.}$$

b) BY VELOCITY ESTIMATE: AVG VEL = 2 FPS.

$$T_c = \frac{L}{V} = \frac{8000}{2 \times 3600} = 1.11 \text{ HR}$$

USE $T_c = 0.7$ HR.

8. LAG TIME $= 0.6 \times T_c = 0.6 \times 0.7 = \underline{0.42 \text{ HR}}$

9. UNIT DURATION, $D \leq \frac{L_t}{3} = 0.14 > 0.083$

USE $D = 0.083$ HR $= 5$ MIN.

10. TIME TO PEAK, $T_p = \frac{D}{2} + L_t = \frac{0.083}{2} + 0.42 = \underline{0.46 \text{ HR}}$

11. PEAK DISCHARGE, $q_p = \frac{484 \times A}{T_p}$

$$q_p = \frac{484 \times (1.26)}{0.46}, \quad q_p = \underline{1326 \text{ CFS}}$$

BUSCH WILDLIFE AREA LAKE #35 DAM (10092) AND U/S DAMS.

DETERMINATION OF PMP

1. DETERMINE DRAINAGE AREA OF THE BASIN

D.A. = 2107 ACRES TOTAL

2. DETERMINE PMP INDEX RAINFALL (200 SQ. MI + 24 HRS DURATION

LOCATION OF CENTROID OF BASIN

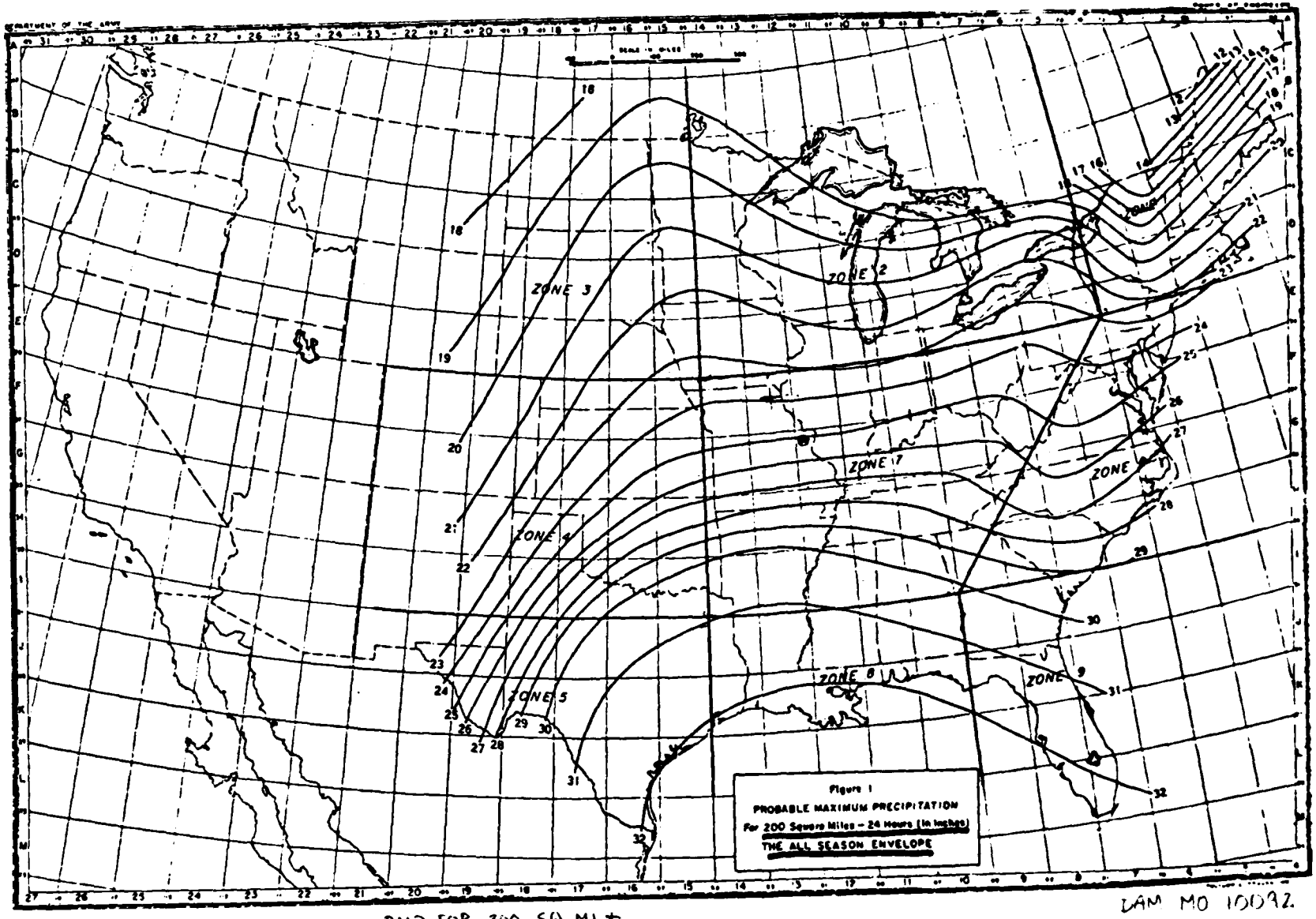
LONG. = 90°44' 14" LAT. = 38°42'04" PMP. = 25.1"

3. DETERMINE BASIN RAINFALL IN TERMS OF PERCENTAGE OF PMP INDEX RAINFALL FOR VARIOUS DURATIONS:

LOCATION LONG. = 90°44' 14" LAT. = 38°42'04"

⇒ ZONE 7

DURATION (HOURS)	PERCENT OF INDEX RAINFALL	TOTAL RAINFALL	RAINFALL INCREMENTS	DURATION OF INCREMENTS
6	100	25.1	25.1	6
12	120	30.1	5.0	6
24	130	32.6	2.5	12



PMP FOR 200 SQ. MI. +
24 HRS DURATION = 25.1"

DAM MO 10092

LOCATION OF CENTROID
OF WATERSHED:
LAT. 38° 42' 04" LONG 90° 44' 4

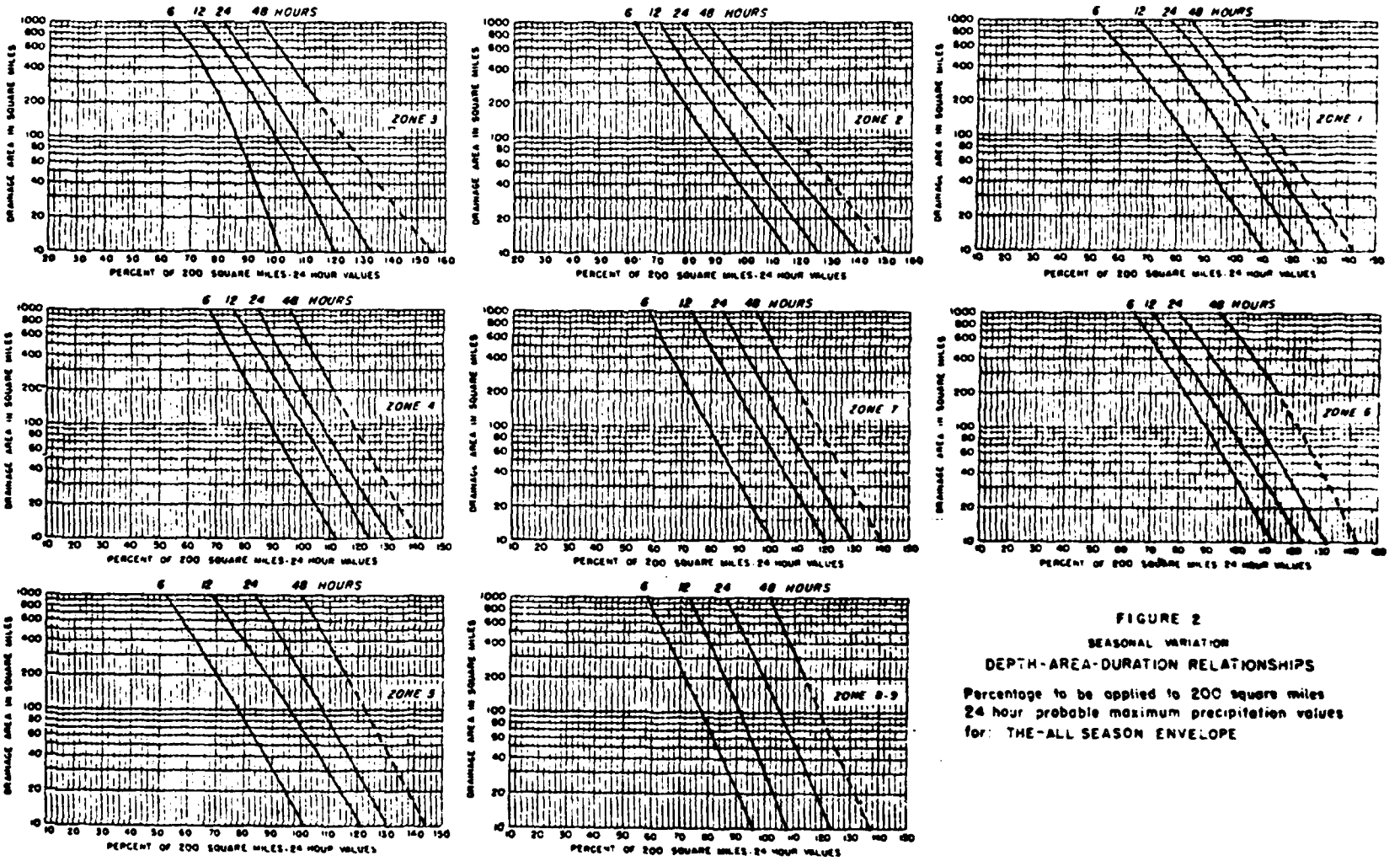


FIGURE 2

SEASONAL VARIATION

DEPTH-AREA-DURATION RELATIONSHIPS

Percentage to be applied to 200 square miles 24 hour probable maximum precipitation values for: THE-ALL SEASON ENVELOPE

BUSH WILDLIFE AREA LAKE NO. 35 DAM

DETERMINATION OF HYDROLOGIC SOIL GROUP & SCS CURVE NO.

1. According to the Soil Map of Missouri the watershed soils consist of Group 'D' Soils.

2. About 95 percent of the watershed area are in park and open space and used for recreational purpose. The remaining area has been developed for commercial and industrial uses: Assume 'Fair' condition for the park and open space area.

Thus $CN = 0.95 \times 84 + .05 \times 93$

$\simeq 85$ for Soil Group D & AMC-II

$\Rightarrow CN = 94$ for AMC-III

BUSCH WILDLIFE AREA LAKE NO 35 DAM

100 YR FLOOD BY REGRESSION EQUATION

REGRESSION EQUATION FOR 100-YR FLOOD FOR MISSOURI:

$$Q_{100} = 85.1\ A^{0.934}\ A^{-0.02}\ S^{0.576}$$

WHERE

A = DRAINAGE AREA IN SQ. MI.

S = MAIN CHANNEL SLOPE FT/MI (AVG. SLOPE BETWEEN 0.1L AND 0.85L).

FOR BUSCH WILDLIFE AREA NO. 35 DAM:

A = 3.29 SQ. MI. (TOTAL)

S = 50 FT/MI.

$$Q_{100} = 85.1\ (3.29)^{0.934}\ (3.29)^{-0.02}\ (50)^{0.576}$$

$$Q_{100} = \underline{\underline{2400\ \text{CFS.}}}$$

HEC1DB INPUT DATA

22

```
**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********************************
  1          A1                    DAM SAFETY INSPECTION - MISSOURI
  2          A2              BUSCH WILDLIFE AREA NO. 35 LAKE DAM (10092)
  3          A3          PMF AND 50 PERCENT PMF DETERMINATION AND ROUTING
  4          B    300      0      5      0      0      0      0      0      0      0
  5          B1     5
  6          J      1      0      1
  7          J1   1.0    0.5
  8          K      3  10093                                          1
  9          K1 INPUT PMP INDEX RAINFALL, SCS UNIT HYDROGRAPH PARAMETERS FOR U/S DAM (10093)
 10          M      1      2   0.36              0.36    1.0
 11          P            25.1    100    120    130
 12          T                                                      -1    -94
 13          A2           0.36
 14          K      0      0      1
 15          K      1  10093                                          1
 16          K1 ROUTE HYDROGRAPH THROUGH U/S DAM (10093)
 17          Y                                 1      1
 18          Y1     1                                          -587.0     -1
 19          Y4 567.0   589.0   591.0   593.0   595.0   596.0
 20          Y5     0      52     465      69    6751   12410
 21          Y6     0.     20.     87.    260.    586.    858.
 22          SE   568.    580.    587.    593.    600.    610.
 23          SS   587.
 24          D    593.
 25          K      1  10093                                          1
 26          M1 INPUT PMF INDEX RAINFALL, SCS UNIT HYDROGRAPH PARAMETERS FOR U/S DAM (10093)
 27          M      1      2   1.26              1.26    1.0
 28          P            25.1    100    120    130
 29          T                                                      -1    -94
 30          A2           0.42
 31          K      0      0      1
 32          K      1  10099                                          1
 33          K1 ROUTE HYDROGRAPH THROUGH U/S DAM (10099)
 34          Y                                 1      1
 35          Y1     1                                          -596.0     -1
 36          Y4 596.0   598.0   600.0   602.0   604.0   606.0   607.0
 37          Y5     0     653    1301    2920    5991    9695   14121
 38          SS   0.0     69.    138.    319.    501.
 39          SE   583.    596.    600.    606.    610.
 40          SS   596.
 41          SD   600.
 42          K      2  10092                                          1
 43          K1 COMBINE ROUTED U/S HYDROGRAPHS
 44          K      0  10092                                          1
 45          K1 INPUT PMF INDEX RAINFALL, SCS UNIT HYDROGRAPH PARAMETERS FOR MAIN DAM (10092)
 46          M      1      2   1.67              1.67    1.0
 47          P            25.1    100    120    130
 48          T                                                      -1    -94
 49          A2           0.48
 50          K      0      0      1
```

```
51        K      2   10092                                                  1
52        K1 COMBINE LOCAL HYDROGRAPHS WITH U/S ROUTED HYDROGRAPHS BEFOR ROUTING
53        K      1   10092                                   2              1
54        K1 . IF COMBINED HYDROGRAPHS THROUGH DUSCH NO. 1  LAKE DAM (10092)
55        Y                                   1      1
56        Y1     1                                                   557.5      -1
57        Y4  557.0    558.5    560.0    562.0    563.5    564.0    565.0    566.0    569.0
58        Y5    0.0    149.     903.0   1850.    2751.    4006.    8552.   14770.   30525.
59        Y5          1.5      515      1001     1274     1658     2396
60        Y8    525     540      550      557      563    563.5     570
61        Y1   557.
62        Y2   563.5
63        Z      99
```

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

```
RUNOFF HYDROGRAPH AT        10094
ROUTE HYDROGRAPH TO         10097
RUNOFF HYDROGRAPH AT        10369
ROUTE HYDROGRAPH TO         10089
COMBINE 2 HYDROGRAPHS AT    10092
RUNOFF HYDROGRAPH AT        10095
COMBINE 2 HYDROGRAPHS AT    10042
ROUTE HYDROGRAPH TO         10093
END OF NETWORK
```

INFLOW PMF AND ONE-HALF PMF HYDROGRAPHS

UPSTREAM DAM (MO. 10093)

```
*******************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION       JULY 1978
  LAST MODIFICATION  26 FEB 79
*******************************

RUN  DATE= 79/03/[illegible]
     TIME= 1[illegible]59.59.

                    DAM SAFETY INSPECTION - MISSOURI
                 UPPER WILDLIFE AREA NO. [illegible] LAKE DAM (10093)
              PMF AND 50 PERCENT PMF DETERMINATION AND ROUTING

                                 JOB SPECIFICATION
          NQ      NHR     NMIN     IDAY      IHR     IMIN    METRC     IPLT     IPRT    NSTAN
         300       0        5        0        0        [illegible]        0        0        0        0        0
                                   JOPER      NWT    LROPT     TRACE
                                       5        0        [illegible]        0

                          MULTI-PLAN ANALYSES TO BE PERFORMED
                              NPLAN= 1 NRTIO= 2 LRTIO= 1
          RTIOS=   1.00    .50


**********        **********        **********        **********        **********

                                 SUB-AREA RUNOFF COMPUTATION

     INPUT PMP INDEX RAINFALL, SCS UNIT HYDROGRAPH PARAMETERS FOR U/S DAM (10093)

                  ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                  10093                0       0       0       0       1       0       0

                                 HYDROGRAPH DATA
          IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISTAQ   ISAME   LOCAL
              1       2     .38    0.00     .35    1.00   0.000       0       0       0

                                   PRECIP DATA
                   SPFE     PMS       R6      R12      R24      R48      R72      R96
                   0.00   25.10   100.00   120.00   130.00     0.00     0.00     0.00

                                    LOSS DATA
     LROPT    STRKR    DLTKR    RTIOL    ERAIN    STRKS    RTIOK    STRTL    CNSTL    ALSMS    RTIMP
         0     0.00     0.00     1.00     0.00     0.00     1.00    -1.00   -94.00     0.00     0.00

          CURVE NO =  -94.00  WETNESS =   -1.00  EFFECT CN =   94.00

                                 UNIT HYDROGRAPH DATA
                          TC=   0.00    LAG=    .[illegible]

                                  RECESSION DATA
                        STRTQ=     0.00    QRCSN=     0.00    RTIOR= 1.00

     UNIT HYDROGRAPH ON END OF PERIOD ORDINATES, TC=    0.00 HOURS, LAG=    .36  VOL= 1.00
     46.      145.      301.      413.      [illegible]      389.      315.      217.      151.      109.
     73.       56.       40.       28.       [illegible]       14.       10.        7.        5.        4.
```

						END-OF-PERIOD						
MO.DA	HR.MN	PERIOD	RAIN	FLOW	LOSS	COND 2	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COND 2
1.01	.05	1	.01	0.00	.01	0.	1.01	12.35	151	.01	.01	.00	475.
1.01	.10	2	.01	0.00	.01	0.	1.01	12.40	152	.01	.01	.00	505.
1.01	.15	3	.01	.00	.01	0.	1.01	12.45	153	.01	.01	.00	526.
1.01	.20	4	.01	0.00	.01	0.	1.01	12.50	154	.01	.01	.00	541.
1.01	.25	5	.01	.00	.01	0.	1.01	12.55	155	.01	.01	.00	552.
1.01	.30	6	.01	0.00	.01	0.	1.01	13.00	156	.01	.01	.00	560.
1.01	.35	7	.01	0.00	.01	0.	1.01	13.05	157	.05	.05	.00	566.
1.01	.40	8	.01	0.00	.01	0.	1.01	13.10	158	.05	.05	.00	578.
1.01	.45	9	.01	0.00	.01	0.	1.01	13.15	159	.05	.05	.00	593.
1.01	.50	10	.01	.00	.01	0.	1.01	13.20	160	.05	.05	.00	613.
1.01	.55	11	.01	.00	.01	0.	1.01	13.25	161	.05	.05	.00	632.
1.01	1.00	12	.01	.00	.01	0.	1.01	13.30	162	.05	.05	.00	650.
1.01	1.05	13	.01	.00	.01	0.	1.01	13.35	163	.05	.05	.00	664.
1.01	1.10	14	.01	.00	.01	1.	1.01	13.40	164	.05	.05	.00	673.
1.01	1.15	15	.01	.00	.01	0.	1.01	13.45	165	.05	.05	.00	680.
1.01	1.20	16	.01	.00	.01	0.	1.01	13.50	166	.05	.05	.00	685.
1.01	1.25	17	.01	.00	.01	0.	1.01	13.55	167	.05	.05	.00	690.
1.01	1.30	18	.01	.00		0.	1.01	14.00	168	.05	.05	.00	691.
1.01	1.35	19	.01	.00	.01	0.	1.01	14.05	169	.01	.01	.00	696.
1.01	1.40	20	.01	.00	.01	0.	1.01	14.10	170	.01	.01	.00	706.
1.01	1.45	21	.01	.00	.01	0.	1.01	14.15	171	.01	.01	.00	726.
1.01	1.50	22	.01	.01	.01	10.	1.01	14.20	172	.01	.01	.00	752.
1.01	1.55	23	.01	.01	.01	11.	1.01	14.25	173	.01	.01	.00	761.
1.01	2.00	24	.01	.01	.01	12.	1.01	14.30	174	.01	.01	.00	805.
1.01	2.05	25	.01	.01	.01	13.	1.01	14.35	175	.01	.01	.00	824.
1.01	2.10	26	.01	.01	.01	13.	1.01	14.40	176	.01	.01	.00	836.
1.01	2.15	27	.01	.01	.01	14.	1.01	14.45	177	.01	.01	.00	846.
1.01	2.20	28	.01	.01	.01	15.	1.01	14.50	178	.01	.01	.00	855.
1.01	2.25	29	.01	.01	.01	16.	1.01	14.55	179	.01	.01	.00	860.
1.01	2.30	30	.01	.01	.01	17.	1.01	15.00	180	.01	.01	.00	864.
1.01	2.35	31	.01	.01	.01	17.	1.01	15.05	181	.19	.19	.00	871.
1.01	2.40	32	.01	.01	.01	18.	1.01	15.10	182	.38	.38	.00	854.
1.01	2.45	33	.01	.01	.01	19.	1.01	15.15	183	.38	.38	.00	846.
1.01	2.50	34	.01	.01	.01	19.	1.01	15.20	184	.57	.57	.00	[illegible]
1.01	2.55	35	.01	.01	.01	20.	1.01	15.25	185	.67	.67	.00	922.
1.01	3.00	36	.01	.01	.01	21.	1.01	15.30	186	1.62	1.62	.00	1070.
1.01	3.05	37	.01	.01	.01	21.	1.01	15.35	187	1.67	1.67	.00	1399.
1.01	3.10	38	.01	.01	.01	22.	1.01	15.40	188	1.55	1.55	.00	1718.
1.01	3.15	39	.01	.01	.01	22.	1.01	15.45	189	.67	.67	.00	2511.
1.01	3.20	40	.01	.01	.01	23.	1.01	15.50	190	.57	.57	.00	2918.
1.01	3.25	41	.01	.01	.00	24.	1.01	15.55	191	.38	.38	.00	3021.
1.01	3.30	42	.01	.01	.00	25.	1.01	16.00	192	.38	.38	.00	2875.
1.01	3.35	43	.01	.01	.00	24.	1.01	16.05	193	.29	.29	.00	2518.
1.01	3.40	44	.01	.01	.00	24.	1.01	16.10	194	.29	.29	.00	2100.
1.01	3.45	45	.01	.01	.00	25.	1.01	16.15	195	.29	.29	.00	1835.
1.01	3.50	46	.01	.01	.00	25.	1.01	16.20	196	.29	.29	.00	1572.
1.01	3.55	47	.01	.01	.00	25.	1.01	16.25	197	.29	.29	.00	1365.
1.01	4.00	48	.01	.01	.00	26.	1.01	16.30	198	.29	.29	.00	1209.
1.01	4.05	49	.01	.01	.00	26.	1.01	16.35	199	.29	.29	.00	1096.
1.01	4.10	50	.01	.01	.00	26.	1.01	16.40	200	.29	.29	.00	1015.
1.01	4.15	51	.01	.01	.00	27.	1.01	16.45	201	.29	.29	.00	958.
1.01	4.20	52	.01	.01	.00	27.	1.01	16.50	202	.29	.29	.00	917.
1.01	4.25	53	.01	.01	.00	27.	1.01	16.55	203	.29	.29	.00	888.
1.01	4.30	54	.01	.01	.00	27.	1.01	17.00	204	.29	.29	.00	867.
1.01	4.35	55	.01	.01	.00	28.	1.01	17.05	205	.23	.23	.00	850.

1.01	4.40	56	.01	.01	.00	28.
1.01	4.45	57	.01	.01	.00	28.
1.01	4.50	58	.01	.01	.00	29.
1.01	4.55	59	.01	.01	.00	29.
1.01	5.00	60	.01	.01	.00	29.
1.01	5.05	61	.01	.01	.00	29.
1.01	5.10	62	.01	.01	.00	29.
1.01	5.15	63	.01	.01	.00	30.
1.01	5.20	64	.01	.01	.00	30.
1.01	5.25	65	.01	.01	.00	30.
1.01	5.30	66	.01	.01	.00	30.
1.01	5.35	67	.01	.01	.00	30.
1.01	5.40	68	.01	.01	.00	31.
1.01	5.45	69	.01	.01	.00	31.
1.01	5.50	70	.01	.01	.00	31.
1.01	5.55	71	.01	.01	.00	31.
1.01	6.00	72	.01	.01	.00	31.
1.01	6.05	73	.07	.06	.01	33.
1.01	6.10	74	.07	.06	.01	40.
1.01	6.15	75	.07	.06	.01	55.
1.01	6.20	76	.07	.06	.01	74.
1.01	6.25	77	.07	.06	.01	95.
1.01	6.30	78	.07	.06	.01	114.
1.01	6.35	79	.07	.06	.01	131.
1.01	6.40	80	.07	.06	.01	142.
1.01	6.45	81	.07	.06	.01	151.
1.01	6.50	82	.07	.06	.01	157.
1.01	6.55	83	.07	.06	.01	163.
1.01	7.00	84	.07	.06	.01	167.
1.01	7.05	85	.07	.06	.00	170.
1.01	7.10	86	.07	.07	.00	172.
1.01	7.15	87	.07	.07	.00	175.
1.01	7.20	88	.07	.07	.00	176.
1.01	7.25	89	.07	.07	.00	178.
1.01	7.30	90	.07	.07	.00	179.
1.01	7.35	91	.07	.07	.00	180.
1.01	7.40	92	.07	.07	.00	181.
1.01	7.45	93	.07	.07	.00	182.
1.01	7.50	94	.07	.07	.00	182.
1.01	7.55	95	.07	.07	.00	183.
1.01	8.00	96	.07	.07	.00	184.
1.01	8.05	97	.07	.07	.00	184.
1.01	8.10	98	.07	.07	.00	185.
1.01	8.15	99	.07	.07	.00	185.
1.01	8.20	100	.07	.07	.00	186.
1.01	8.25	101	.07	.07	.00	186.
1.01	8.30	102	.07	.07	.00	186.
1.01	8.35	103	.07	.07	.00	187.
1.01	8.40	104	.07	.07	.00	187.
1.01	8.45	105	.07	.07	.00	187.
1.01	8.50	106	.07	.07	.00	188.
1.01	8.55	107	.07	.07	.00	188.
1.01	9.00	108	.07	.07	.00	188.
1.01	9.05	109	.07	.07	.00	188.
1.01	9.10	110	.07	.07	.00	189.
1.01	9.15	111	.07	.07	.00	189.
1.01	9.20	112	.07	.07	.00	189.
1.01	9.25	113	.07	.07	.00	189.
1.01	9.30	114	.07	.07	.00	189.
1.01	9.35	115	.07	.07	.00	190.

1.01	17.10	206	.23	.23	.00	831.
1.01	17.15	207	.23	.23	.00	804.
1.01	17.20	208	.23	.23	.00	771.
1.01	17.25	209	.23	.23	.00	739.
1.01	17.30	210	.23	.23	.00	711.
1.01	17.35	211	.23	.23	.00	689.
1.01	17.40	212	.23	.23	.00	675.
1.01	17.45	213	.23	.23	.00	665.
1.01	17.50	214	.23	.23	.00	658.
1.01	17.55	215	.23	.23	.00	653.
1.01	18.00	216	.23	.23	.00	649.
1.01	18.05	217	.02	.02	.00	637.
1.01	18.10	218	.02	.02	.00	605.
1.01	18.15	219	.02	.02	.00	541.
1.01	18.20	220	.02	.02	.00	454.
1.01	18.25	221	.02	.02	.00	363.
1.01	18.30	222	.02	.02	.00	282.
1.01	18.35	223	.02	.02	.00	215.
1.01	18.40	224	.02	.02	.00	170.
1.01	18.45	225	.02	.02	.00	139.
1.01	18.50	226	.02	.02	.00	115.
1.01	18.55	227	.02	.02	.00	98.
1.01	19.00	228	.02	.02	.00	87.
1.01	19.05	229	.02	.02	.00	78.
1.01	19.10	230	.02	.02	.00	72.
1.01	19.15	231	.02	.02	.00	68.
1.01	19.20	232	.02	.02	.00	65.
1.01	19.25	233	.02	.02	.00	63.
1.01	19.30	234	.02	.02	.00	61.
1.01	19.35	235	.02	.02	.00	60.
1.01	19.40	236	.02	.02	.00	59.
1.01	19.45	237	.02	.02	.00	59.
1.01	19.50	238	.02	.02	.00	58.
1.01	19.55	239	.02	.02	.00	58.
1.01	20.00	240	.02	.02	.00	58.
1.01	20.05	241	.02	.02	.00	58.
1.01	20.10	242	.02	.02	.00	58.
1.01	20.15	243	.02	.02	.00	58.
1.01	20.20	244	.02	.02	.00	58.
1.01	20.25	245	.02	.02	.00	58.
1.01	20.30	246	.02	.02	.00	58.
1.01	20.35	247	.02	.02	.00	58.
1.01	20.40	248	.02	.02	.00	58.
1.01	20.45	249	.02	.02	.00	58.
1.01	20.50	250	.02	.02	.00	58.
1.01	20.55	251	.02	.02	.00	58.
1.01	21.00	252	.02	.02	.00	58.
1.01	21.05	253	.02	.02	.00	58.
1.01	21.10	254	.02	.02	.00	58.
1.01	21.15	255	.02	.02	.00	58.
1.01	21.20	256	.02	.02	.00	58.
1.01	21.25	257	.02	.02	.00	58.
1.01	21.30	258	.02	.02	.00	58.
1.01	21.35	259	.02	.02	.00	58.
1.01	21.40	260	.02	.02	.00	58.
1.01	21.45	261	.02	.02	.00	58.
1.01	21.50	262	.02	.02	.00	58.
1.01	21.55	263	.02	.02	.00	58.
1.01	22.00	264	.02	.02	.00	58.
1.01	22.05	265	.02	.02	.00	58.

1.01	9.40	116	.07	.07	.00	190.	1.01	22.10	266	.02	.02	.00	58.
1.01	9.45	117	.07	.07	.00	190.	1.01	22.15	267	.02	.02	.00	58.
1.01	9.50	118	.07	.07	.00	190.	1.01	22.20	268	.02	.02	.00	58.
1.01	9.55	119	.07	.07	.00	190.	1.01	22.25	269	.02	.02	.00	58.
1.01	10.00	120	.07	.07	.00	190.	1.01	22.30	270	.02	.02	.00	58.
1.01	10.05	121	.07	.07	.00	190.	1.01	22.35	271	.02	.02	.00	58.
1.01	10.10	122	.07	.07	.00	191.	1.01	22.40	272	.02	.02	.00	58.
1.01	10.15	123	.07	.07	.00	191.	1.01	22.45	273	.02	.02	.00	58.
1.01	10.20	124	.07	.07	.00	191.	1.01	22.50	274	.02	.02	.00	58.
1.01	10.25	125	.07	.07	.00	191.	1.01	22.55	275	.02	.02	.00	58.
1.01	10.30	126	.07	.07	.00	191.	1.01	23.00	276	.02	.02	.00	58.
1.01	10.35	127	.07	.07	.00	191.	1.01	23.05	277	.02	.02	.00	58.
1.01	10.40	128	.07	.07	.00	191.	1.01	23.10	278	.02	.02	.00	58.
1.01	10.45	129	.07	.07	.00	191.	1.01	23.15	279	.02	.02	.00	58.
1.01	10.50	130	.07	.07	.00	191.	1.01	23.20	280	.02	.02	.00	58.
1.01	10.55	131	.07	.07	.00	191.	1.01	23.25	281	.02	.02	.00	58.
1.01	11.00	132	.07	.07	.00	191.	1.01	23.30	282	.02	.02	.00	58.
1.01	11.05	133	.07	.07	.00	192.	1.01	23.35	283	.02	.02	.00	58.
1.01	11.10	134	.07	.07	.00	192.	1.01	23.40	284	.02	.02	.00	58.
1.01	11.15	135	.07	.07	.00	192.	1.01	23.45	285	.02	.02	.00	58.
1.01	11.20	136	.07	.07	.00	192.	1.01	23.50	286	.02	.02	.00	58.
1.01	11.25	137	.07	.07	.00	192.	1.01	23.55	287	.02	.02	.00	58.
1.01	11.30	138	.07	.07	.00	192.	1.02	0.00	288	.02	.02	.00	58.
1.01	11.35	139	.07	.07	.00	192.	1.02	.05	289	0.00	0.00	0.00	57.
1.01	11.40	140	.07	.07	.00	192.	1.02	.10	290	0.00	0.00	0.00	54.
1.01	11.45	141	.07	.07	.00	192.	1.02	.15	291	0.00	0.00	0.00	44.
1.01	11.50	142	.07	.07	.00	192.	1.02	.20	292	0.00	0.00	0.00	39.
1.01	11.55	143	.07	.07	.00	192.	1.02	.25	293	0.00	0.00	0.00	30.
1.01	12.00	144	.07	.07	.00	192.	1.02	.30	294	0.00	0.00	0.00	22.
1.01	12.05	145	.21	.21	.00	198.	1.02	.35	295	0.00	0.00	0.00	16.
1.01	12.10	146	.21	.21	.00	219.	1.02	.40	296	0.00	0.00	0.00	11.
1.01	12.15	147	.21	.21	.00	260.	1.02	.45	297	0.00	0.00	0.00	8.
1.01	12.20	148	.21	.21	.00	317.	1.02	.50	298	0.00	0.00	0.00	6.
1.01	12.25	149	.21	.21	.00	377.	1.02	.55	299	0.00	0.00	0.00	4.
1.01	12.30	150	.21	.21	.00	431.	1.02	1.00	300	0.00	0.00	0.00	3.
									SUM	30.63	31.88	.75	88799.
										(1025.)(	810.)(	19.)(	2514.51)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3021.	454.	308.	296.	88813.
CMS	86.	27.	9.	8.	2515.
INCHES		24.64	31.87	31.87	31.87
MM		625.97	809.50	809.50	809.50
AC-FT		473.	612.	612.	612.
THOUS CU		594.	754.	754.	754.

HYDROGRAPH AT STA 1[illegible] FOR PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	1.	1.	2.	3.	4.	5.	6.	7.
8.	10.	11.	12.	13.	15.	16.	19.	16.	17.
17.	18.	19.	19.	20.	21.	21.	22.	22.	23.
23.	23.	24.	24.	25.	25.	25.	26.	26.	26.
27.	27.	27.	28.	28.	28.	28.	29.	29.	29.
29.	29.	30.	30.	30.	30.	30.	31.	31.	31.
31.	31.	33.	60.	74.	74.	95.	114.	131.	142.
151.	157.	163.	167.	170.	172.	175.	176.	178.	179.
180.	181.	182.	183.	183.	184.	184.	185.	185.	186.

186.	186.	187.	187.	187.	188.	188.	188.	188.	189.
189.	189.	189.	189.	190.	190.	190.	190.	190.	190.
190.	191.	191.	191.	191.	191.	191.	191.	191.	191.
191.	191.	192.	192.	192.	192.	192.	192.	192.	192.
192.	192.	192.	192.	197.	219.	267.	317.	377.	431.
475.	505.	526.	581.	582.	560.	568.	578.	593.	613.
632.	650.	664.	673.	675.	685.	689.	691.	696.	706.
726.	752.	780.	808.	825.	839.	848.	855.	860.	864.
861.	854.	886.	862.	920.	1070.	1399.	1918.	2511.	2918.
3221.	2876.	2558.	2168.	1838.	1572.	1365.	1209.	1095.	1015.
958.	917.	886.	867.	852.	831.	804.	771.	739.	711.
689.	675.	665.	656.	653.	649.	637.	605.	541.	454.
363.	282.	215.	170.	139.	115.	96.	87.	79.	72.
65.	65.	63.	61.	60.	59.	59.	58.	58.	58.
58.	58.	58.	58.	58.	58.	58.	58.	58.	58.
58.	58.	58.	58.	58.	58.	58.	58.	58.	58.
58.	58.	58.	58.	58.	58.	58.	58.	58.	58.
58.	58.	58.	58.	58.	58.	58.	58.	58.	58.
58.	58.	58.	58.	58.	58.	58.	58.	57.	54.
48.	39.	30.	22.	16.	11.	8.	6.	4.	3.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3221.	954.	358.	296.	88813.
CMS	91.	27.	9.	8.	2515.
INCHES		24.69	31.87	31.87	31.87
MM		626.97	809.59	809.59	809.59
AC-FT		473.	612.	612.	612.
THOUS CU M		583.	754.	754.	754.

HYDROGRAPH AT STA 10093 FOR PLAN 1, RTIO 2

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	1.	2.	3.	3.	4.
4.	5.	5.	6.	6.	7.	7.	8.	9.	9.
9.	9.	9.	10.	10.	10.	11.	11.	11.	11.
11.	12.	12.	12.	12.	13.	13.	13.	13.	13.
13.	13.	14.	14.	14.	14.	14.	14.	14.	14.
15.	15.	15.	15.	15.	15.	15.	15.	15.	15.
17.	16.	17.	20.	27.	37.	47.	57.	65.	71.
75.	79.	81.	83.	85.	86.	87.	88.	89.	90.
90.	91.	91.	91.	92.	92.	92.	92.	93.	93.
93.	93.	93.	94.	94.	94.	94.	94.	94.	94.
94.	95.	95.	95.	95.	95.	95.	95.	95.	95.
95.	95.	95.	95.	95.	95.	96.	96.	96.	96.
96.	96.	96.	96.	96.	96.	96.	96.	96.	96.
96.	96.	96.	96.	99.	109.	133.	159.	183.	215.
237.	252.	263.	271.	276.	280.	284.	289.	297.	306.
314.	325.	332.	337.	340.	343.	344.	346.	348.	353.
363.	376.	390.	402.	412.	419.	424.	428.	430.	432.
433.	427.	423.	451.	460.	535.	700.	959.	1256.	1499.
1511.	1439.	1279.	1086.	918.	786.	692.	605.	540.	508.
479.	450.	444.	434.	423.	415.	402.	386.	370.	355.
345.	337.	332.	327.	326.	325.	319.	303.	273.	227.
182.	141.	108.	85.	69.	57.	49.	43.	39.	36.
34.	33.	31.	31.	30.	30.	29.	29.	29.	29.
29.	29.	29.	29.	29.	29.	29.	29.	29.	29.
29.	29.	29.	29.	29.	29.	29.	29.	29.	29.
29.	29.	29.	29.	29.	29.	29.	29.	29.	29.
29.	29.	29.	29.	29.	29.	29.	29.	29.	29.

29.	29.	29.	29.	29.	29.	29.	29.	29.	27.
24.	20.	15.	11.	8.	6.	4.	3.	2.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1511.	477.	159.	148.	44406.
CMS	43.	14.	4.	4.	1257.
INCHES		12.32	15.94	15.94	15.94
MM		312.98	404.79	404.79	404.79
AC-FT		536.	506.	506.	506.
THOUSAND CU M		592.	577.	577.	577.

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HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THROUGH U/S DAM (10097)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
10097	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	[illegible]	[illegible]	0.000	[illegible]	-1

STAGE	587.00	589.00	591.00	593.00	595.00	596.00
FLOW	0.00	62.00	65.00	68.00	6791.00	12411.00
CAPACITY=	0.	20.	87.	255.	548.	855.
ELEVATION=	568.	583.	587.	593.	600.	610.

SPEL	SPWID	COQL	EXPL	ELEVL	CODL	CAREA	EXPL
587.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
593.0	.0	0.0	0.

STATION 10093, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	1.	1.	1.	1.	1.	1.	1.	2.
2.	2.	2.	2.	3.	3.	3.	3.	3.	4.
4.	4.	4.	4.	5.	5.	5.	5.	6.	6.
6.	6.	7.	7.	7.	7.	7.	8.	8.	8.
8.	9.	9.	9.	9.	10.	10.	10.	10.	10.
11.	11.	11.	11.	12.	13.	13.	14.	15.	17.
18.	20.	21.	23.	25.	26.	26.	30.	31.	33.
35.	36.	38.	41.	41.	43.	44.	46.	46.	49.

INFLOW PMF AND ONE-HALF PMF HYDROGRAPHS

UPSTREAM DAM (MO. 10089)

588.5	588.5	588.5	588.5	588.5	588.6	588.6	588.6	588.6	588.6
588.6	588.7	588.7	588.7	588.7	588.7	588.7	588.8	588.8	588.9
589.0	589.0	589.1	589.1	589.2	589.3	589.4	589.5	589.6	589.6
[illegible]	589.8	589.9	590.0	590.1	[illegible]	590.3	590.4	590.5	590.6
590.7	590.9	591.0	591.1	591.2	591.3	591.5	591.6	591.7	591.9
592.0	592.1	592.3	592.4	592.5	592.7	592.9	593.1	593.2	593.3
593.4	[illegible]	593.4	593.4	593.3	593.3	593.2	593.2	593.2	593.1
593.1	593.1	593.1	593.1	593.1	593.1	593.1	593.1	593.1	593.1
593.1	593.1	593.1	593.1	593.1	593.1	593.1	593.1	593.1	593.1
593.0	593.0	593.0	593.0	593.0	593.0	593.0	593.0	593.0	593.0
593.0	593.0	592.9	592.9	592.9	592.9	592.9	592.9	592.9	592.9
592.9	592.9	592.8	592.8	592.8	592.8	592.8	592.8	592.8	592.8
592.8	592.7	592.7	592.7	592.7	592.7	592.7	592.7	592.7	592.6
592.6	592.6	592.6	592.6	592.6	592.6	592.6	592.6	592.5	592.5
592.5	592.5	592.5	592.5	592.5	592.5	592.4	592.4	592.4	592.4
592.4	592.4	592.4	592.4	592.3	592.3	592.3	592.3	592.3	592.3
592.3	592.2	592.2	592.2	592.2	592.2	592.1	592.1	592.1	592.1

PEAK OUTFLOW IS 1424. AT TIME 16.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1424.	323.	137.	103.	30932.
CMS	40.	9.	3.	3.	876.
INCHES		8.34	11.10	11.10	11.10
MM		211.71	281.97	281.97	281.97
AC-FT		160.	213.	213.	213.
THOUS CU M		197.	263.	263.	263.

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SUB-AREA RUNOFF COMPUTATION

INPUT PMF INDEX RAINFALL, SCS UNIT HYDROGRAPH PARAMETERS FOR U/S DAM (100PR)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
100PR	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	1.26	0.00	1.25	1.00	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	25.10	100.00	120.00	130.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-94.00	0.00	0.00

CURVE NO = -94.00 WETNESS = -1.00 EFFECT CN = 94.00

UNIT HYDROGRAPH DATA

TC= 0.00 LAG= .42

RECESSION DATA

STRTQ= 5600 QRCSN= 0.00 RTIOR= 1.00

UNIT HYDROGRAPH 27 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .42 VOL= 1.00

114.	547.	723.	1112.	1304.	1306.	116.	969.	799.	518.		
374.	299.	215.	160.	120.	80.	5.	49.	37.	27.		
20.	15.	11.	9.	6.	4.	2.					

END-OF-PERIOD FLOW

HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01 .05	1	.01	0.00	.01	0.	1.01 12.45	151	.21	.21	.00	1513.
1.01 .10	2	.01	0.00	.01	0.	1.01 12.50	152	.21	.21	.00	1648.
1.01 .15	3	.01	0.00	.01	0.	1.01 12.55	153	.21	.21	.00	1746.
1.01 .20	4	.01	0.00	.01	0.	1.01 12.50	154	.21	.21	.00	1817.
1.01 .25	5	.01	0.00	.01	0.	1.01 12.55	155	.21	.21	.00	1870.
1.01 .30	6	.01	0.00	.01	0.	1.01 13.00	156	.21	.21	.00	1911.
1.01 .35	7	.01	0.00	.01	0.	1.01 13.05	157	.25	.25	.00	1946.
1.01 .40	8	.01	0.00	.01	0.	1.01 13.10	158	.25	.25	.00	1983.
1.01 .45	9	.01	0.00	.01	0.	1.01 13.15	159	.25	.25	.00	2030.
1.01 .50	10	.01	.00	.01	0.	1.01 13.20	160	.25	.25	.00	2089.
1.01 .55	11	.01	.00	.01	0.	1.01 13.25	161	.25	.25	.00	2153.
1.01 1.00	12	.01	.00	.01	1.	1.01 13.30	162	.25	.25	.00	2215.
1.01 1.05	13	.01	.00	.01	1.	1.01 13.35	163	.25	.25	.00	2269.
1.01 1.10	14	.01	.00	.01	3.	1.01 13.40	164	.25	.25	.00	2314.
1.01 1.15	15	.01	.00	.01	5.	1.01 13.45	165	.25	.25	.00	2347.
1.01 1.20	16	.01	.00	.01	8.	1.01 13.50	166	.25	.25	.00	2371.
1.01 1.25	17	.01	.00	.01	11.	1.01 13.55	167	.25	.25	.00	2389.
1.01 1.30	18	.01	.00	.01	15.	1.01 14.00	168	.25	.25	.00	2402.
1.01 1.35	19	.01	.00	.01	19.	1.01 14.05	169	.31	.31	.00	2420.
1.01 1.40	20	.01	.00	.01	23.	1.01 14.10	170	.31	.31	.00	2449.
1.01 1.45	21	.01	.00	.01	26.	1.01 14.15	171	.31	.31	.00	2500.
1.01 1.50	22	.01	.01	.01	30.	1.01 14.20	172	.31	.31	.00	2573.
1.01 1.55	23	.01	.01	.01	34.	1.01 14.25	173	.31	.31	.00	2658.
1.01 2.00	24	.01	.01	.01	37.	1.01 14.30	174	.31	.31	.00	2742.
1.01 2.05	25	.01	.01	.01	41.	1.01 14.35	175	.31	.31	.00	2817.
1.01 2.10	26	.01	.01	.01	44.	1.01 14.40	176	.31	.31	.00	2879.
1.01 2.15	27	.01	.01	.01	47.	1.01 14.45	177	.31	.31	.00	2924.
1.01 2.20	28	.01	.01	.01	50.	1.01 14.50	178	.31	.31	.00	2957.
1.01 2.25	29	.01	.01	.01	53.	1.01 14.55	179	.31	.31	.00	2982.
1.01 2.30	30	.01	.01	.01	56.	1.01 15.00	180	.31	.31	.00	3001.
1.01 2.35	31	.01	.01	.01	58.	1.01 15.05	181	.19	.19	.00	3001.
1.01 2.40	32	.01	.01	.01	61.	1.01 15.10	182	.38	.38	.00	2990.
1.01 2.45	33	.01	.01	.01	63.	1.01 15.15	183	.38	.38	.00	2975.
1.01 2.50	34	.01	.01	.01	66.	1.01 15.20	184	.57	.57	.00	3004.
1.01 2.55	35	.01	.01	.01	68.	1.01 15.25	185	.57	.57	.00	3137.
1.01 3.00	36	.01	.01	.01	70.	1.01 15.30	186	1.62	1.62	.00	3507.
1.01 3.05	37	.01	.01	.01	72.	1.01 15.35	187	2.67	2.67	.00	4395.
1.01 3.10	38	.01	.01	.01	74.	1.01 15.40	188	1.05	1.05	.00	5673.
1.01 3.15	39	.01	.01	.01	75.	1.01 15.45	189	.67	.67	.00	7357.
1.01 3.20	40	.01	.01	.01	77.	1.01 15.50	190	.57	.57	.00	8871.
1.01 3.25	41	.01	.01	.00	79.	1.01 15.55	191	.38	.38	.00	9599.
1.01 3.30	42	.01	.01	.00	80.	1.01 16.00	192	.38	.38	.00	9772.
1.01 3.35	43	.01	.01	.00	82.	1.01 16.05	193	.29	.29	.00	9246.
1.01 3.40	44	.01	.01	.00	83.	1.01 16.10	194	.29	.29	.00	8322.
1.01 3.45	45	.01	.01	.00	85.	1.01 16.15	195	.29	.29	.00	7208.
1.01 3.50	46	.01	.01	.00	86.	1.01 16.20	196	.29	.29	.00	6208.
1.01 3.55	47	.01	.01	.00	88.	1.01 16.25	197	.29	.29	.00	5415.
1.01 4.00	48	.01	.01	.00	89.	1.01 16.30	198	.29	.29	.00	4793.
1.01 4.05	49	.01	.01	.00	90.	1.01 16.35	199	.29	.29	.00	4395.
1.01 4.10	50	.01	.01	.00	91.	1.01 16.40	200	.29	.29	.00	3935.

1.01	4.15	51	.01	.01	.00	92.	1.01	16.45	201	.29	.29	.00	3660.
1.01	4.20	52	.01	.01	.00	93.	1.01	16.50	202	.29	.29	.00	3453.
1.01	4.25	53	.01	.01	.00	94.	1.01	16.55	203	.29	.29	.00	3300.
1.01	4.30	54	.01	.01	.00	95.	1.01	17.00	204	.29	.29	.00	3186.
1.01	4.35	55	.01	.01	.00	96.	1.01	17.05	205	.23	.23	.00	3095.
1.01	4.40	56	.01	.01	.00	97.	1.01	17.10	206	.23	.23	.00	3010.
1.01	4.45	57	.01	.01	.00	98.	1.01	17.15	207	.23	.23	.00	2918.
1.01	4.50	58	.01	.01	.00	99.	1.01	17.20	208	.23	.23	.00	2814.
1.01	4.55	59	.01	.01	.00	100.	1.01	17.25	209	.23	.23	.00	2708.
1.01	5.00	60	.01	.01	.00	101.	1.01	17.30	210	.23	.23	.00	2605.
1.01	5.05	61	.01	.01	.00	101.	1.01	17.35	211	.23	.23	.00	2515.
1.01	5.10	62	.01	.01	.00	102.	1.01	17.40	212	.23	.23	.00	2440.
1.01	5.15	63	.01	.01	.00	103.	1.01	17.45	213	.23	.23	.00	2383.
1.01	5.20	64	.01	.01	.00	104.	1.01	17.50	214	.23	.23	.00	2343.
1.01	5.25	65	.01	.01	.00	104.	1.01	17.55	215	.23	.23	.00	2316.
1.01	5.30	66	.01	.01	.00	105.	1.01	18.00	216	.23	.23	.00	2256.
1.01	5.35	67	.01	.01	.00	105.	1.01	18.05	217	.02	.02	.00	2258.
1.01	5.40	68	.01	.01	.00	106.	1.01	18.10	219	.02	.02	.00	2175.
1.01	5.45	69	.01	.01	.00	107.	1.01	18.15	219	.02	.02	.00	2017.
1.01	5.50	70	.01	.01	.00	107.	1.01	18.20	220	.02	.02	.00	1779.
1.01	5.55	71	.01	.01	.00	108.	1.01	18.25	221	.02	.02	.00	1502.
1.01	6.00	72	.01	.01	.00	108.	1.01	18.30	222	.02	.02	.00	1226.
1.01	6.05	73	.07	.06	.01	114.	1.01	18.35	223	.02	.02	.00	980.
1.01	6.10	74	.07	.06	.01	131.	1.01	18.40	224	.02	.02	.00	775.
1.01	6.15	75	.07	.06	.01	163.	1.01	18.45	225	.02	.02	.00	627.
1.01	6.20	76	.07	.06	.01	218.	1.01	18.50	226	.02	.02	.00	519.
1.01	6.25	77	.07	.06	.01	282.	1.01	18.55	227	.02	.02	.00	439.
1.01	6.30	78	.07	.06	.01	346.	1.01	19.00	228	.02	.02	.00	378.
1.01	6.35	79	.07	.06	.01	404.	1.01	19.05	229	.02	.02	.00	333.
1.01	6.40	80	.07	.06	.01	459.	1.01	19.10	230	.02	.02	.00	299.
1.01	6.45	81	.07	.06	.01	492.	1.01	19.15	231	.02	.02	.00	274.
1.01	6.50	82	.07	.06	.01	521.	1.01	19.20	232	.02	.02	.00	256.
1.01	6.55	83	.07	.06	.01	544.	1.01	19.25	233	.02	.02	.00	242.
1.01	7.00	84	.07	.06	.01	562.	1.01	19.30	234	.02	.02	.00	232.
1.01	7.05	85	.07	.06	.00	577.	1.01	19.35	235	.02	.02	.00	224.
1.01	7.10	86	.07	.07	.00	589.	1.01	19.40	236	.02	.02	.00	218.
1.01	7.15	87	.07	.07	.00	599.	1.01	19.45	237	.02	.02	.00	214.
1.01	7.20	88	.07	.07	.00	607.	1.01	19.50	238	.02	.02	.00	211.
1.01	7.25	89	.07	.07	.00	614.	1.01	19.55	239	.02	.02	.00	208.
1.01	7.30	90	.07	.07	.00	620.	1.01	20.00	240	.02	.02	.00	206.
1.01	7.35	91	.07	.07	.00	624.	1.01	20.05	241	.02	.02	.00	205.
1.01	7.40	92	.07	.07	.00	629.	1.01	20.10	242	.02	.02	.00	204.
1.01	7.45	93	.07	.07	.00	632.	1.01	20.15	243	.02	.02	.00	204.
1.01	7.50	94	.07	.07	.00	635.	1.01	20.20	244	.02	.02	.00	204.
1.01	7.55	95	.07	.07	.00	639.	1.01	20.25	245	.02	.02	.00	204.
1.01	8.00	96	.07	.07	.00	641.	1.01	20.30	246	.02	.02	.00	204.
1.01	8.05	97	.07	.07	.00	643.	1.01	20.35	247	.02	.02	.00	204.
1.01	8.10	98	.07	.07	.00	645.	1.01	20.40	248	.02	.02	.00	204.
1.01	8.15	99	.07	.07	.00	647.	1.01	20.45	249	.02	.02	.00	204.
1.01	8.20	100	.07	.07	.00	649.	1.01	20.50	250	.02	.02	.00	204.
1.01	8.25	101	.07	.07	.00	650.	1.01	20.55	251	.02	.02	.00	204.
1.01	8.30	102	.07	.07	.00	651.	1.01	21.00	252	.02	.02	.00	204.
1.01	8.35	103	.07	.07	.00	652.	1.01	21.05	253	.02	.02	.00	204.
1.01	8.40	104	.07	.07	.00	654.	1.01	21.10	254	.02	.02	.00	204.
1.01	8.45	105	.07	.07	.00	6[illegible]	1.01	21.15	255	.02	.02	.00	204.
1.01	8.50	106	.07	.07	.00	656.	1.01	21.20	256	.02	.02	.00	204.
1.01	8.55	107	.07	.07	.00	657.	1.01	21.25	257	.02	.02	.00	204.
1.01	9.00	108	.07	.07	.00	658.	1.01	21.30	258	.02	.02	.00	204.
1.01	9.05	109	.07	.07	.00	659.	1.01	21.35	259	.02	.02	.00	204.
1.01	9.10	110	.07	.07	.00	6[illegible]	1.01	21.40	260	.02	.02	.00	204.

1.01	9.15	111	.07	.07	.00	660.	1.01	21.45	261	.02	.02	.00	204.
1.01	9.20	112	.07	.07	.00	661.	1.01	21.50	262	.02	.02	.00	204.
1.01	9.25	113	.07	.07	.00	662.	1.01	21.55	263	.02	.02	.00	204.
1.01	9.30	114	.07	.07	.00	662.	1.01	22.00	264	.02	.02	.00	204.
1.01	9.35	115	.07	.07	.00	663.	1.01	22.05	265	.02	.02	.00	204.
1.01	9.40	116	.07	.07	.00	663.	1.01	22.10	266	.02	.02	.00	204.
1.01	9.45	117	.07	.07	.00	664.	1.01	22.15	267	.02	.02	.00	204.
1.01	9.50	118	.07	.07	.00	664.	1.01	22.20	268	.02	.02	.00	204.
1.01	9.55	119	.07	.07	.00	665.	1.01	22.25	269	.02	.02	.00	204.
1.01	10.00	120	.07	.07	.00	665.	1.01	22.30	270	.02	.02	.00	204.
1.01	10.05	121	.07	.07	.00	664.	1.01	22.35	271	.02	.02	.00	204.
1.01	10.10	122	.07	.07	.00	666.	1.01	22.40	272	.02	.02	.00	204.
1.01	10.15	123	.07	.07	.00	667.	1.01	22.45	273	.02	.02	.00	204.
1.01	10.20	124	.07	.07	.00	667.	1.01	22.50	274	.02	.02	.00	204.
1.01	10.25	125	.07	.07	.00	668.	1.01	22.55	275	.02	.02	.00	204.
1.01	10.30	126	.07	.07	.00	668.	1.01	23.00	276	.02	.02	.00	204.
1.01	10.35	127	.07	.07	.00	668.	1.01	23.05	277	.02	.02	.00	204.
1.01	10.40	128	.07	.07	.00	669.	1.01	23.10	278	.02	.02	.00	204.
1.01	10.45	129	.07	.07	.00	669.	1.01	23.15	279	.02	.02	.00	204.
1.01	10.50	130	.07	.07	.00	669.	1.01	23.20	280	.02	.02	.00	204.
1.01	10.55	131	.07	.07	.00	669.	1.01	23.25	281	.02	.02	.00	204.
1.01	11.00	132	.07	.07	.00	670.	1.01	23.30	282	.02	.02	.00	204.
1.01	11.05	133	.07	.07	.00	670.	1.01	23.35	283	.02	.02	.00	204.
1.01	11.10	134	.07	.07	.00	670.	1.01	23.40	284	.02	.02	.00	204.
1.01	11.15	135	.07	.07	.00	671.	1.01	23.45	285	.02	.02	.00	204.
1.01	11.20	136	.07	.07	.00	671.	1.01	23.50	286	.02	.02	.00	204.
1.01	11.25	137	.07	.07	.00	671.	1.01	23.55	287	.02	.02	.00	204.
1.01	11.30	138	.07	.07	.00	671.	1.02	0.00	[illegible]	.02	.02	.00	204.
1.01	11.35	139	.07	.07	.00	671.	1.02	.05	[illegible]	0.00	0.00	0.00	202.
1.01	11.40	140	.07	.07	.00	672.	1.02	.10	[illegible]	0.00	0.00	0.00	194.
1.01	11.45	141	.07	.07	.00	672.	1.02	.15	291	0.00	0.00	0.00	179.
1.01	11.50	142	.07	.07	.00	672.	1.02	.20	292	0.00	0.00	0.00	156.
1.01	11.55	143	.07	.07	.00	672.	1.02	.25	293	0.00	0.00	0.00	129.
1.01	12.00	144	.07	.07	.00	67 .	1.02	.30	294	0.00	0.00	0.	101.
1.01	12.05	145	.21	.21	.00	[illegible]	1.02	.35	295	0.00	0.00	0.00	77.
1.01	12.10	146	.21	.21	.00	736.	1.02	.40	296	0.00	0.00	0.00	57.
1.01	12.15	147	.21	.21	.00	836.	1.02	.45	297	0.00	0.00	0.00	42.
1.01	12.20	148	.21	.21	.00	990.	1.02	.50	298	0.00	0.00	0.00	31.
1.01	12.25	149	.21	.21	.00	1171.	1.02	.55	299	0.00	0.00	0.00	23.
1.01	12.30	150	.21	.21	.00	1350.	1.02	1.00	300	0.00	0.00	0.00	17.

SUM	32.63	31.88	.75	317820.
	(829.)	(810.)	(19.)	(8801.44)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9772.	3330.	1079.	1031.	310815.
CMS	277.	94.	31.	29.	8801.
INCHES		24.58	31.87	31.87	31.87
MM		624.39	809.51	809.51	809.51
AC-FT		1651.	2141.	2141.	2141.
THOUS. CU. M		2037.	2640.	2640.	2640.

HYDROGRAPH AT STA 13083 FOR PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	1.	1.	3.	5.	9.	11.	15.	19.	23.
26.	30.	34.	37.	41.	44.	47.	50.	53.	56.
58.	61.	63.	66.	68.	70.	72.	74.	75.	77.
79.	80.	82.	83.	85.	86.	88.	89.	90.	91.

92.	93.	94.	95.	96.	97.	98.	99.	100.	101.
101.	102.	103.	104.	104.	105.	106.	106.	107.	107.
109.	108.	114.	131.	165.	219.	282.	344.	404.	454.
495.	521.	544.	562.	577.	589.	599.	607.	614.	620.
624.	629.	632.	635.	638.	641.	643.	645.	647.	648.
650.	651.	652.	654.	655.	656.	657.	658.	659.	659.
660.	661.	662.	662.	663.	663.	664.	664.	665.	665.
666.	666.	667.	667.	668.	668.	668.	669.	669.	669.
669.	670.	670.	670.	671.	671.	671.	671.	671.	672.
672.	672.	672.	672.	688.	736.	831.	990.	1171.	1352.
1514.	1648.	1746.	1817.	1870.	1911.	1946.	1983.	2030.	2089.
2153.	2215.	2264.	2314.	2347.	2371.	2389.	2402.	2420.	2449.
2500.	2573.	2658.	2742.	2817.	2873.	2914.	2957.	2992.	3001.
3001.	2990.	2975.	3004.	3137.	3507.	4345.	5673.	7357.	8971.
9699.	9772.	9246.	8322.	7265.	6208.	5411.	4793.	4355.	3935.
3663.	3453.	3361.	3319.	3095.	3110.	2918.	2814.	2784.	2615.
2515.	2444.	2357.	2344.	2316.	2296.	2253.	2175.	2017.	1779.
1502.	1226.	960.	775.	627.	519.	439.	378.	333.	299.
274.	256.	242.	232.	224.	218.	214.	211.	209.	206.
205.	204.	204.	204.	204.	204.	204.	204.	204.	204.
204.	204.	204.	204.	204.	204.	204.	204.	204.	204.
204.	204.	204.	204.	204.	204.	204.	204.	204.	204.
204.	204.	204.	204.	204.	204.	204.	204.	204.	204.
204.	204.	204.	204.	204.	204.	204.	204.	202.	194.
179.	156.	129.	101.	77.	57.	42.	31.	23.	17.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9773.	2330.	1329.	1136.	31812.
CMS	277.	94.	31.	32.	901.
INCHES		20.02	21.87	21.87	31.87
MM		624.79	909.51	809.51	809.51
AC-FT		1651.	2141.	2141.	2141.
THOUS CU M		2037.	2640.	2640.	2640.

HYDROGRAPH AT STA 13089 FOR PLAN 1, RTIO 2

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	1.	2.	3.	4.	6.	7.	9.	11.
13.	15.	17.	19.	20.	22.	24.	25.	27.	28.
29.	30.	32.	33.	34.	35.	36.	37.	38.	39.
39.	40.	41.	42.	42.	43.	44.	44.	45.	46.
46.	47.	47.	48.	48.	49.	49.	49.	50.	50.
51.	51.	51.	52.	52.	52.	53.	53.	53.	54.
58.	54.	57.	65.	87.	109.	141.	173.	202.	227.
246.	261.	272.	281.	289.	295.	300.	304.	307.	310.
312.	314.	316.	318.	319.	320.	322.	323.	327.	324.
325.	326.	326.	327.	327.	328.	328.	329.	329.	330.
330.	330.	331.	331.	331.	332.	332.	332.	332.	333.
333.	333.	333.	334.	334.	334.	334.	334.	334.	336.
335.	335.	335.	335.	335.	335.	336.	336.	336.	336.
336.	336.	336.	336.	344.	368.	412.	475.	525.	676.
757.	824.	873.	909.	935.	955.	973.	992.	1015.	1045.
1077.	1108.	1135.	1157.	1173.	1185.	1196.	1201.	1210.	1224.
1250.	1287.	1329.	1371.	1409.	1440.	1462.	1479.	1491.	1500.
1500.	1495.	1488.	1502.	1561.	1754.	2177.	2836.	3675.	4436.
4858.	4811.	4623.	4161.	3601.	3104.	2708.	2396.	2153.	1977.
1830.	1727.	1615.	1593.	1547.	1505.	1459.	1407.	1354.	1303.
1257.	1223.	1192.	1172.	1158.	1148.	1129.	1088.	1008.	889.
751.	613.	470.	388.	313.	260.	220.	189.	167.	150.

[illegible]	128.	[illegible]	116.	112.	109.	107.	105.	104.	103.
103.	102.	102.	102.	102.	102.	102.	102.	102.	102.
[illegible]	102.	102.	102.	102.	102.	102.	102.	102.	102.
[illegible]	102.	[illegible]	102.	102.	102.	102.	102.	102.	102.
102.	[illegible]	[illegible]	102.	102.	102.	102.	102.	102.	102.
102.	102.	102.	102.	102.	102.	102.	102.	101.	97.
[illegible]	[illegible]	[illegible]	51.	34.	28.	21.	16.	12.	9.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	[illegible]	[illegible]	5[illegible]0.	514.	155407.
CMS	[illegible]	47.	15.	15.	4401.
INCHES		[illegible]	15.94	15.94	15.94
MM		[illegible]	404.76	404.76	404.76
AC-FT		426.	[illegible]	1070.	1070.
THOUS CU M		1015.	1320.	1320.	1320.

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HYDROGRAPH ROUTING

ROUT HYDROGRAPH THROUGH U/S DAM (10389)

ITAP	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
[illegible]	1	0	0	0	[illegible]	1	0	0

ROUTING DATA

AMSKK	TSKK	X	IRES	ISAME	IOPT	LROPT	TSTS
0.0	0.000	0.00	1	1	0	[illegible]	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	.000	0.000	-[illegible]	-1

STAGE	596.00	[illegible]	[illegible]	632.00	6[illegible]4.00	6[illegible].00	607.00
FLOW	0.00	653.00	1501.00	2426.00	5991.00	9895.00	14121.00
CAPACITY=	[illegible]	[illegible]	138.	715.	508.		
ELEVATION=	590.	[illegible]	600.	605.	610.		

SPEL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
596.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
630.0	0.0	0.0	0.

STATION 10389, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	1.	3.	5.	4.	5.	7.
9.	12.	14.	17.	20.	22.	25.	28.	31.	34.
37.	39.	42.	45.	48.	50.	53.	55.	56.	58.
62.	64.	66.	68.	70.	72.	74.	76.	77.	79.

INFLOW PMF AND ONE-HALF PMF HYDROGRAPHS

BUSCH NO. 35 LAKE DAM

17.	170.	169.	169.	169.	169.	[illegible]	[illegible]	169.	169.
166.	175.	[illegible]	167.	197.	145.	[illegible]	[illegible]	[illegible]	120.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
[illegible]	[illegible]	190.	[illegible]	[illegible]	5521.
[illegible]	[illegible]	[illegible]	[illegible]	18.	5265.
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	1.11.	1201.
[illegible]		1187.	1570.	[illegible]	1572.

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FARM FLOOD CONTROL

INPUT [illegible] UNIT HYDROGRAPH PARAMETERS FOR MULTI-AM (1.099)

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	97		2	0	2	2	1	0	0

[illegible] DATA

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1		1.67	[illegible]	1.67	1.0	[illegible]	[illegible]	0	0

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	120.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.00

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	1.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.00	[illegible]

[illegible] VELOCITY = [illegible] [illegible] = [illegible]

[illegible] DATA

[illegible] = [illegible] LAGE = [illegible]

[illegible] DATA

[illegible] 0-[illegible] 0.00 RITCH 1.00

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	5.	[illegible]	[illegible]	[illegible]	[illegible]	1514.	1353.	1142.	870.		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	179.	[illegible]	107.	51.	42.		
49.	[illegible]	22.	[illegible]	17.	14.	[illegible]	8.	6.	3.		
1.											

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.01	.05	1	.01	0.00	.01	0.	1.01	12.5	151	.21	.21	.00	1900.
1.01	.10	2	.01	0.00	.01	0.	1.01	12.5	152	.21	.21	.00	2010.
1.01	.15	3	.01	0.00	.01	0.	1.01	12.5	153	.21	.21	.00	2149.
1.01	.20	4	.01	0.00	.01	0.	1.01	12.5	154	.21	.21	.00	2251.
1.01	.25	5	.01	0.00	.01	0.	1.01	12.5	155	.21	.21	.00	2361.
1.01	.30	6	.01	0.00	.01	0.	1.01	3.0	156	.21	.21	.00	2471.
1.01	.35	7	.01	0.00	.01	0.	1.01	12.05	157	.25	.25	.00	2518.

1.01	.40	8	.01	0.00	.01	0.	1.01	13.10	158	.26	.25	.00	2567.
1.01	.45	9	.01	0.00	.01	0.	1.01	13.15	159	.25	.25	.00	2627.
1.01	.50	10	.01	.00	.01	0.	1.01	13.20	160	.25	.25	.00	2699.
1.01	.55	11	.01	.00	.01	0.	1.01	13.25	161	.25	.25	.00	2779.
1.01	1.00	12	.01	.00	.01	1.	1.01	13.30	162	.25	.25	.00	2858.
1.01	1.05	13	.01	.00	.01	1.	1.01	13.35	163	.25	.25	.00	2934.
1.01	1.10	14	.01	.00	.01	3.	1.01	13.40	164	.25	.25	.00	2999.
1.01	1.15	15	.01	.00	.01	5.	1.01	13.45	165	.25	.25	.00	3054.
1.01	1.20	16	.01	.00	.01	8.	1.01	13.50	166	.25	.25	.00	3097.
1.01	1.25	17	.01	.00	.01	12.	1.01	13.55	167	.25	.25	.00	3128.
1.01	1.30	18	.01	.00	.01	16.	1.01	14.00	168	.25	.25	.00	3153.
1.01	1.35	19	.01	.00	.01	21.	1.01	14.05	169	.31	.31	.00	3179.
1.01	1.40	20	.01	.00	.01	26.	1.01	14.10	170	.31	.31	.00	3215.
1.01	1.45	21	.01	.00	.01	31.	1.01	14.15	171	.31	.31	.00	3268.
1.01	1.50	22	.01	.01	.01	36.	1.01	14.20	172	.31	.31	.00	3347.
1.01	1.55	23	.01	.01	.01	41.	1.01	14.25	173	.31	.31	.00	3444.
1.01	2.00	24	.01	.01	.01	46.	1.01	14.30	174	.31	.31	.00	3546.
1.01	2.05	25	.01	.01	.01	50.	1.01	14.35	175	.31	.31	.00	3645.
1.01	2.10	26	.01	.01	.01	54.	1.01	14.40	176	.31	.31	.00	3733.
1.01	2.15	27	.01	.01	.01	58.	1.01	14.45	177	.31	.31	.00	3807.
1.01	2.20	28	.01	.01	.01	61.	1.01	14.50	178	.31	.31	.00	3863.
1.01	2.25	29	.01	.01	.01	66.	1.01	14.55	179	.31	.31	.00	3906.
1.01	2.30	30	.01	.01	.01	70.	1.01	15.00	180	.31	.31	.00	3938.
1.01	2.35	31	.01	.01	.01	74.	1.01	15.05	181	.19	.19	.00	3950.
1.01	2.40	32	.01	.01	.01	77.	1.01	15.10	182	.38	.38	.00	3951.
1.01	2.45	33	.01	.01	.01	81.	1.01	15.15	183	.38	.38	.00	3946.
1.01	2.50	34	.01	.01	.01	84.	1.01	15.20	184	.57	.57	.00	3970.
1.01	2.55	35	.01	.01	.01	87.	1.01	15.25	185	.67	.67	.00	4089.
1.01	3.00	36	.01	.01	.01	90.	1.01	15.30	186	1.62	1.62	.00	4446.
1.01	3.05	37	.01	.01	.01	92.	1.01	15.35	187	2.67	2.67	.00	5267.
1.01	3.10	38	.01	.01	.01	95.	1.01	15.40	188	1.05	1.05	.00	6583.
1.01	3.15	39	.01	.01	.01	96.	1.01	15.45	189	.67	.67	.00	8328.
1.01	3.20	40	.01	.01	.01	100.	1.01	15.50	190	.57	.57	.00	10136.
1.01	3.25	41	.01	.01	.00	102.	1.01	15.55	191	.38	.38	.00	11529.
1.01	3.30	42	.01	.01	.00	105.	1.01	16.00	192	.38	.38	.00	12119.
1.01	3.35	43	.01	.01	.00	107.	1.01	16.05	193	.29	.29	.00	12033.
1.01	3.40	44	.01	.01	.00	109.	1.01	16.10	194	.29	.29	.00	11373.
1.01	3.45	45	.01	.01	.00	111.	1.01	16.15	195	.29	.29	.00	10343.
1.01	3.50	46	.01	.01	.00	112.	1.01	16.20	196	.29	.29	.00	9107.
1.01	3.55	47	.01	.01	.00	114.	1.01	16.25	197	.29	.29	.00	7982.
1.01	4.00	48	.01	.01	.00	116.	1.01	16.30	198	.29	.29	.00	7073.
1.01	4.05	49	.01	.01	.00	118.	1.01	16.35	199	.29	.29	.00	6746.
1.01	4.10	50	.01	.01	.00	119.	1.01	16.40	200	.29	.29	.00	5767.
1.01	4.15	51	.01	.01	.00	121.	1.01	16.45	201	.29	.29	.00	5305.
1.01	4.20	52	.01	.01	.00	122.	1.01	16.50	202	.29	.29	.00	4960.
1.01	4.25	53	.01	.01	.00	124.	1.01	16.55	203	.29	.29	.00	4691.
1.01	4.30	54	.01	.01	.00	125.	1.01	17.00	204	.29	.29	.00	4482.
1.01	4.35	55	.01	.01	.00	126.	1.01	17.05	205	.23	.23	.00	4313.
1.01	4.40	56	.01	.01	.00	128.	1.01	17.10	206	.23	.23	.00	4169.
1.01	4.45	57	.01	.01	.00	129.	1.01	17.15	207	.23	.23	.00	4033.
1.01	4.50	58	.01	.01	.00	130.	1.01	17.20	208	.23	.23	.00	3890.
1.01	4.55	59	.01	.01	.00	131.	1.01	17.25	209	.23	.23	.00	3744.
1.01	5.00	60	.01	.01	.00	132.	1.01	17.30	210	.22	.22	.00	3604.
1.01	5.05	61	.01	.01	.00	133.	1.01	17.35	211	.23	.23	.00	3476.
1.01	5.10	62	.01	.01	.00	134.	1.01	17.40	212	.23	.23	.00	3367.
1.01	5.15	63	.01	.01	.00	135.	1.01	17.45	213	.23	.23	.00	3275.
1.01	5.20	64	.01	.01	.00	136.	1.01	17.50	214	.23	.23	.00	3202.
1.01	5.25	65	.01	.01	.00	137.	1.01	17.55	215	.23	.23	.00	3145.
1.01	5.30	66	.01	.01	.00	138.	1.01	18.00	216	.23	.23	.00	3100.
1.01	5.35	67	.01	.01	.00	139.	1.01	18.05	217	.02	.02	.00	3062.

1.01	5.40	68	.01	.01	.00	140.
1.01	5.45	69	.01	.01	.00	141.
1.01	5.50	70	.01	.01	.00	142.
1.01	5.55	71	.01	.01	.00	142.
1.01	6.00	72	.01	.01	.00	143.
1.01	6.05	73	.07	.06	.01	149.
1.01	6.10	74	.07	.06	.01	165.
1.01	6.15	75	.07	.06	.01	197.
1.01	6.20	76	.07	.06	.01	251.
1.01	6.25	77	.07	.06	.01	320.
1.01	6.30	78	.07	.06	.01	39 .
1.01	6.35	79	.07	.06	.01	470.
1.01	6.40	80	.07	.06	.01	539.
1.01	6.45	81	.07	.06	.01	598.
1.01	6.50	82	.07	.06	.01	645.
1.01	6.55	83	.07	.06	.01	682.
1.01	7.00	84	.07	.06	.01	712.
1.01	7.05	85	.07	.06	.00	737.
1.01	7.10	86	.07	.07	.00	757.
1.01	7.15	87	.07	.07	.00	774.
1.01	7.20	88	.07	.07	.00	787.
1.01	7.25	89	.07	.07	.00	799.
1.01	7.30	90	.07	.07	.00	809.
1.01	7.35	91	.07	.07	.00	817.
1.01	7.40	92	.07	.07	.00	824.
1.01	7.45	93	.07	.07	.00	830.
1.01	7.50	94	.07	.07	.00	835.
1.01	7.55	95	.07	.07	.00	840.
1.01	8.00	96	.07	.07	.00	844.
1.01	8.05	97	.07	.07	.00	848.
1.01	8.10	98	.07	.07	.00	851.
1.01	8.15	99	.07	.07	.00	854.
1.01	8.20	100	.07	.07	.00	857.
1.01	8.25	101	.07	.07	.00	859.
1.01	8.30	102	.07	.07	.00	861.
1.01	8.35	103	.07	.07	.00	863.
1.01	8.40	104	.07	.07	.00	865.
1.01	8.45	105	.07	.07	.00	866.
1.01	8.50	106	.07	.07	.00	868.
1.01	8.55	107	.07	.07	.00	869.
1.01	9.00	108	.07	.07	.00	871.
1.01	9.05	109	.07	.07	.00	872.
1.01	9.10	110	.07	.07	.00	873.
1.01	9.15	111	.07	.07	.00	874.
1.01	9.20	112	.07	.07	.00	875.
1.01	9.25	113	.07	.07	.00	876.
1.01	9.30	114	.07	.07	.00	877.
1.01	9.35	115	.07	.07	.00	878.
1.01	9.40	116	.07	.07	.00	878.
1.01	9.45	117	.07	.07	.00	879.
1.01	9.50	118	.07	.07	.00	880.
1.01	9.55	119	.07	.07	.00	881.
1.01	10.00	120	.07	.07	.00	881.
1.01	10.05	121	.07	.07	.00	882.
1.01	10.10	122	.07	.07	.00	883.
1.01	10.15	123	.07	.07	.00	883.
1.01	10.20	124	.07	.07	.00	884.
1.01	10.25	125	.07	.07	.00	884.
1.01	10.30	126	.07	.07	.00	885.
1.01	10.35	127	.07	.07	.00	885.

1.01	18.10	218	.02	.02	.00	2548.
1.01	18.15	219	.02	.02	.00	2798.
1.01	18.20	220	.02	.02	.00	2544.
1.01	18.25	221	.02	.02	.00	2234.
1.01	18.30	222	.02	.02	.00	1905.
1.01	18.35	223	.02	.02	.00	1584.
1.01	18.40	224	.02	.02	.00	1297.
1.01	18.45	225	.02	.02	.00	1054.
1.01	18.50	226	.02	.02	.00	870.
1.01	18.55	227	.02	.02	.00	732.
1.01	19.00	228	.02	.02	.00	627.
1.01	19.05	229	.02	.02	.00	544.
1.01	19.10	230	.02	.02	.00	480.
1.01	19.15	231	.02	.02	.00	431.
1.01	19.20	232	.02	.02	.00	393.
1.01	19.25	233	.02	.02	.00	364.
1.01	19.30	234	.02	.02	.00	342.
1.01	19.35	235	.02	.02	.00	325.
1.01	19.40	236	.02	.02	.00	312.
1.01	19.45	237	.02	.02	.00	301.
1.01	19.50	238	.02	.02	.00	294.
1.01	19.55	239	.02	.02	.00	288.
1.01	20.00	240	.02	.02	.00	283.
1.01	20.05	241	.02	.02	.00	279.
1.01	20.10	242	.02	.02	.00	276.
1.01	20.15	243	.02	.02	.00	274.
1.01	20.20	244	.02	.02	.00	272.
1.01	20.25	245	.02	.02	.00	271.
1.01	20.30	246	.02	.02	.00	270.
1.01	20.35	247	.02	.02	.00	270.
1.01	20.40	248	.02	.02	.00	270.
1.01	20.45	249	.02	.02	.00	270.
1.01	20.50	250	.02	.02	.00	270.
1.01	20.55	251	.02	.02	.00	270.
1.01	21.00	252	.02	.02	.00	270.
1.01	21.05	253	.02	.02	.00	270.
1.01	21.10	254	.02	.02	.00	270.
1.01	21.15	255	.02	.02	.00	270.
1.01	21.20	256	.02	.02	.00	270.
1.01	21.25	257	.02	.02	.00	270.
1.01	21.30	258	.02	.02	.00	270.
1.01	21.35	259	.02	.02	.00	270.
1.01	21.40	260	.02	.02	.00	270.
1.01	21.45	261	.02	.02	.00	270.
1.01	21.50	262	.02	.02	.00	270.
1.01	21.55	263	.02	.02	.00	270.
1.01	22.00	264	.02	.02	.00	270.
1.01	22.05	265	.02	.02	.00	270.
1.01	22.10	266	.02	.02	.00	270.
1.01	22.15	267	.02	.02	.00	270.
1.01	22.20	268	.02	.02	.00	270.
1.01	22.25	269	.02	.02	.00	270.
1.01	22.30	270	.02	.02	.00	270.
1.01	22.35	271	.02	.02	.00	270.
1.01	22.40	272	.02	.02	.00	270.
1.01	22.45	273	.02	.02	.00	270.
1.01	22.50	274	.02	.02	.00	270.
1.01	22.55	275	.02	.02	.00	270.
1.01	23.00	276	.02	.02	.00	270.
1.01	23.05	277	.02	.02	.00	270.

1.01	10.40	[illegible]	.07	.07	.00	886.	1.01	23.10	278	.02	.02	.00	270.
1.01	10.45	[illegible]	.07	.07	[illegible]	886.	1.01	23.15	279	.02	.02	.00	270.
1.01	10.50	130	.07	.07	.00	887.	1.01	23.20	280	.02	.02	.00	270.
1.01	10.55	131	.07	.07	.00	887.	1.01	23.25	281	.02	.02	.00	270.
1.01	11.00	132	.07	.07	.00	887.	1.01	23.30	282	.02	.02	.00	270.
1.01	11.05	133	.07	.07	.00	888.	1.01	23.35	283	.02	.02	.00	270.
1.01	11.10	134	.07	.07	.00	888.	1.01	23.40	284	.02	.02	.00	270.
1.01	11.15	135	.07	.07	.00	888.	1.01	23.45	285	.02	.02	.00	270.
1.01	11.20	136	.07	.07	.00	889.	1.01	23.50	286	.02	.02	.00	270.
1.01	11.25	137	.07	.07	.00	889.	1.01	23.55	287	.02	.02	.00	270.
1.01	11.30	138	.07	.07	.00	889.	1.02	0.00	288	.02	.02	.00	270.
1.01	11.35	139	.07	.07	[illegible]	890.	1.02	.05	289	0.00	0.00	0.00	268.
1.01	11.40	140	.07	.07	.00	890.	1.02	.10	290	0.00	0.00	0.00	261.
1.01	11.45	141	.07	.07	.00	890.	1.02	.15	291	0.00	0.00	0.00	247.
1.01	11.50	142	.07	.07	.00	890.	1.02	.20	292	0.00	0.00	0.00	224.
1.01	11.55	143	.07	.07	.00	891.	1.02	.25	293	0.00	0.00	0.00	194.
1.01	12.00	144	.07	.07	.00	891.	1.02	.30	294	0.00	0.00	0.00	161.
1.01	12.05	145	.21	.21	.00	907.	1.02	.35	295	0.00	0.00	0.00	130.
1.01	12.10	146	.21	.21	.00	950.	1.02	.40	296	0.00	0.00	0.00	101.
1.01	12.15	147	.21	.21	.00	1046.	1.02	.45	297	0.00	0.00	0.00	77.
1.01	12.20	148	.21	.21	.00	1201.	1.02	.50	298	0.00	0.00	0.00	59.
1.01	12.25	149	.21	.21	.00	1394.	1.02	.55	299	0.00	0.00	0.00	46.
1.01	12.30	150	.21	.21	.00	1617.	1.02	1.00	300	0.00	0.00	0.00	35.
									SUM	32.63	31.98	.75	411902.
										(828.)	(812.)	(19.)	(11663.)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	12119.	4602.	1430.	1373.	411902.
CMS	343.	125.	40.	39.	11664.
INCHES		24.92	31.07	31.87	31.[illegible]
MM		632.75	789.40	809.40	8[illegible].40
AC-FT		2183.	2[illegible]7.	2[illegible]7.	2[illegible]7.
THOUS CU M		2692.	3[illegible]8.	3490.	3[illegible].

HYDROGRAPH AT STA 10092 FOR PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	1.	1.	3.	5.	7.	12.	16.	21.	26.
31.	36.	40.	45.	50.	54.	58.	63.	66.	70.
78.	77.	81.	84.	87.	89.	92.	95.	98.	101.
102.	105.	107.	109.	111.	112.	114.	116.	118.	119.
121.	122.	124.	125.	126.	128.	129.	130.	131.	132.
133.	134.	135.	136.	137.	138.	139.	140.	141.	142.
142.	143.	149.	166.	197.	241.	326.	391.	470.	539.
598.	645.	682.	712.	737.	757.	775.	787.	799.	809.
817.	828.	833.	835.	840.	845.	849.	851.	854.	857.
859.	861.	863.	865.	866.	868.	869.	870.	872.	873.
874.	875.	876.	877.	878.	879.	879.	880.	881.	881.
882.	883.	883.	884.	884.	885.	885.	886.	886.	887.
887.	887.	888.	888.	888.	889.	889.	889.	890.	890.
890.	890.	891.	891.	907.	950.	1046.	1201.	1394.	1617.
1822.	2010.	2169.	2291.	2381.	2451.	2510.	2567.	2627.	2699.
2779.	2859.	2934.	2999.	3044.	3077.	3128.	3163.	3171.	3215.
3268.	3347.	3444.	3546.	3645.	3733.	3807.	3863.	3900.	3938.
3950.	3951.	3946.	3970.	4089.	4446.	5267.	6583.	6528.	10106.
11529.	12119.	12033.	11371.	10343.	9107.	7967.	7073.	6348.	5767.
5305.	4968.	4691.	[illegible]	4313.	4169.	4051.	3890.	3744.	3600.
3476.	3367.	3275.	3202.	3145.	3100.	3[illegible].	2946.	2[illegible].	2544.

2234.	1905.	1588.	1297.	1054.	870.	732.	627.	544.	480.
431.	353.	364.	342.	325.	312.	301.	294.	288.	283.
272.	276.	274.	272.	271.	270.	270.	270.	270.	270.
270.	270.	270.	270.	270.	270.	270.	270.	270.	270.
270.	270.	270.	270.	270.	270.	270.	270.	270.	270.
270.	270.	270.	270.	270.	270.	270.	270.	270.	270.
270.	270.	270.	270.	270.	270.	270.	270.	268.	261.
247.	224.	194.	161.	130.	101.	77.	59.	46.	35.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	12119.	4400.	1430.	1373.	411897.
CMS	343.	124.	40.	39.	11664.
INCHES		24.52	7[illegible].57	31.87	31.87
MM		622.75	809.40	809.40	809.40
AC-FT		2183.	2837.	2837.	2837.
THOUS CU M		2692.	3499.	3499.	3499.

HYDROGRAPH AT STA 10092 FOR PLAN 1, RTIO 2

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	1.	1.	3.	4.	6.	8.	10.	13.
15.	18.	20.	24.	26.	27.	29.	31.	33.	35.
37.	39.	40.	42.	43.	45.	46.	48.	49.	50.
51.	52.	53.	54.	55.	56.	57.	58.	59.	60.
60.	61.	62.	62.	63.	64.	64.	65.	66.	66.
67.	67.	68.	68.	69.	69.	70.	70.	70.	71.
71.	72.	74.	83.	99.	125.	160.	198.	235.	269.
299.	323.	341.	355.	365.	379.	387.	394.	400.	404.
409.	412.	415.	419.	420.	422.	424.	425.	427.	428.
429.	431.	431.	432.	433.	434.	435.	435.	436.	437.
437.	437.	438.	438.	439.	439.	440.	440.	440.	441.
441.	441.	442.	442.	442.	442.	442.	443.	443.	443.
443.	444.	444.	444.	444.	444.	445.	445.	445.	445.
445.	445.	445.	445.	445.	476.	523.	600.	700.	806.
911.	1005.	1085.	1145.	1191.	1225.	1255.	1283.	1314.	1350.
1389.	1429.	1467.	1500.	1527.	1548.	1564.	1576.	1588.	1607.
1634.	1674.	1722.	1773.	1822.	1866.	1903.	1932.	1953.	1969.
1975.	1975.	1973.	1985.	2045.	2223.	2634.	3291.	4164.	5093.
5765.	6060.	6017.	5685.	5172.	4553.	3991.	3536.	3174.	2884.
2653.	2480.	2346.	2241.	2156.	2084.	2017.	1945.	1872.	1802.
1736.	1684.	1637.	1601.	1573.	1550.	1521.	1474.	1395.	1272.
1117.	953.	792.	648.	527.	435.	366.	313.	272.	240.
216.	197.	182.	171.	162.	156.	151.	147.	144.	141.
140.	138.	137.	136.	136.	135.	135.	135.	135.	135.
135.	135.	135.	135.	135.	135.	135.	135.	135.	135.
135.	135.	135.	135.	135.	135.	135.	135.	135.	135.
135.	135.	135.	135.	135.	135.	135.	135.	135.	135.
135.	135.	135.	135.	135.	135.	135.	135.	134.	131.
123.	112.	97.	81.	67.	51.	39.	30.	23.	18.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6060.	2201.	715.	686.	205946.
CMS	172.	62.	20.	19.	5832.
INCHES		12.26	15.93	15.93	15.93
MM		311.50	404.70	404.70	404.70
AC-FT		1091.	1418.	1418.	1418.
THOUS CU M		1346.	1750.	1750.	1750.

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COMBINE HYDROGRAPHS

COMBINE LOCAL HYDROGRAPHS WITH U/S ROUTED HYDROGRAPHS BEFOR ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
10092	2	0	0	0	0	1	0	0

SUM OF 2 HYDROGRAPHS AT 10092 PLAN 1 RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	1.	2.	3.	6.	10.	15.	20.	27.	33.
40.	48.	55.	62.	70.	77.	85.	92.	99.	106.
112.	119.	125.	131.	137.	143.	149.	155.	156.	163.
168.	173.	177.	181.	186.	189.	193.	197.	201.	204.
207.	211.	214.	217.	219.	222.	225.	228.	230.	233.
235.	237.	240.	242.	244.	246.	248.	250.	252.	254.
255.	257.	264.	283.	321.	385.	471.	568.	671.	771.
863.	944.	1013.	1075.	1129.	1177.	1220.	1258.	1292.	1323.
1350.	1374.	1396.	1416.	1434.	1450.	1465.	1479.	1491.	1502.
1513.	1522.	1531.	1539.	1546.	1553.	1559.	1565.	1571.	1574.
1578.	1581.	1585.	1587.	1590.	1593.	1595.	1597.	1599.	1601.
1603.	1604.	1606.	1607.	1608.	1610.	1611.	1613.	1614.	1615.
1616.	1617.	1618.	1619.	1620.	1621.	1622.	1623.	1623.	1624.
1624.	1625.	1625.	1626.	1626.	1633.	1930.	1942.	2215.	2500.
2794.	3055.	3302.	3518.	3685.	3840.	4023.	4151.	4295.	4445.
4734.	5140.	5407.	5595.	5740.	5853.	5947.	6017.	6087.	6166.
6268.	6407.	6576.	6757.	6937.	7105.	7257.	7376.	7477.	7562.
7616.	7646.	7681.	7707.	7861.	8422.	9633.	11833.	14849.	18235.
21173.	22920.	23518.	22519.	20855.	18732.	16648.	14526.	13345.	12159.
11172.	10384.	9751.	9247.	8836.	8494.	8185.	7880.	7577.	7287.
7014.	6866.	6692.	6544.	6421.	6318.	6209.	6044.	5788.	5397.
4895.	4342.	3780.	3256.	2790.	2404.	2107.	1880.	1698.	1524.
1397.	1269.	1170.	1087.	1015.	953.	899.	852.	812.	777.
746.	719.	696.	676.	659.	644.	631.	620.	611.	602.
595.	589.	583.	578.	573.	570.	566.	563.	561.	558.
556.	555.	553.	552.	551.	550.	549.	548.	547.	546.
546.	545.	545.	545.	544.	544.	544.	544.	543.	543.
543.	543.	543.	543.	543.	543.	542.	542.	540.	532.
516.	489.	452.	410.	367.	326.	289.	258.	232.	209.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	23518.	8527.	2741.	2651.	795309.
CMS	660.	241.	78.	75.	22521.
INCHES		24.11	31.23	31.23	31.23
MM		612.38	793.29	793.29	793.29
AC-FT		4228.	5477.	5477.	5477.
THOUS CU M		5215.	6756.	6756.	6756.

SUM OF 2 HYDROGRAPHS AT 10092 PLAN 1 RTIO 2

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	1.	2.	3.	5.	7.	10.	13.	17.
20.	24.	28.	31.	35.	39.	43.	46.	49.	53.

56.	59.	62.	66.	68.	71.	74.	77.	79.	82.
84.	86.	89.	91.	93.	95.	97.	98.	100.	102.
104.	105.	107.	108.	110.	111.	112.	114.	115.	116.
117.	119.	120.	121.	122.	123.	124.	125.	126.	127.
1[illegible].	128.	132.	141.	162.	192.	[illegible]	234.	335.	385.
432.	472.	517.	537.	565.	[illegible]	610.	629.	[illegible]	661.
67[illegible].	597.	6[illegible].	70[illegible].	717.	725.	733.	739.	745.	751.
75[illegible].	761.	765.	76[illegible].	77[illegible].	77[illegible].	78[illegible].	783.	786.	788.
791.	793.	795.	797.	79[illegible].	[illegible].	803.	805.	806.	808.
809.	811.	812.	815.	815.	[illegible].	817.	818.	[illegible]	820.
822.	823.	824.	824.	825.	[illegible]	[illegible]	826.	829.	831.
831.	831.	832.	832.	842.	868.	922.	1014.	1137.	1276.
1400.	1558.	1681.	1786.	1874.	1949.	2014.	2[illegible]78.	2141.	2209.
2291.	2353.	2423.	2486.	2544.	2592.	2624.	2669.	2704.	2742.
2770.	2851.	2923.	3000.	3077.	31[illegible].	3216.	3271.	3316.	3367.
340[illegible].	3420.	3442.	3475.	35[illegible].	3744.	4262.	5367.	6953.	8565.
9837.	10692.	11072.	10834.	10111.	9232.	8294.	7455.	6733.	6232.
5[illegible].	5456.	5165.	4917.	4769.	4[illegible]7.	4357.	4189.	4022.	3863.
3717.	3587.	3473.	3[illegible]7.	3298.	3232.	3162.	3077.	2[illegible]1.	2761.
2519.	2254.	1986.	1737.	1515.	1331.	1185.	1066.	963.	874.
798.	732.	675.	627.	585.	548.	517.	489.	465.	445.
427.	411.	397.	385.	375.	366.	3[illegible].	352.	346.	341.
337.	333.	3[illegible].	32[illegible].	324.	321.	31[illegible].	317.	31[illegible].	314.
313.	312.	311.	310.	310.	[illegible]	308.	308.	307.	307.
307.	306.	306.	3[illegible].	306.	305.	305.	305.	305.	305.
305.	305.	305.	305.	304.	304.	304.	304.	303.	299.
291.	277.	259.	236.	217.	196.	178.	162.	149.	137.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	11277.	4124.	1361.	1306.	591879.
CMS	319.	117.	39.	37.	11897.
INCHES		13.66	15.39	15.39	15.39
MM		346.87	390.89	390.89	390.89
AC-FT		2045.	2189.	2689.	2689.
THOUS CU M		2522.	3329.	3329.	3329.

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HYDROGRAPH ROUTING

ROUTE COMBINED HYDROGRAPHS THROUGH BUSCH NO. 35 LAKE DAM (10092)

ICTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
10092	1	0	0	2	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-557.	-1

STAGE	557.00	559.00	560.00	562.00	563.50	564.00	565.00	566.00	568.00
FLOW	0.00	149.00	863.00	1856.00	2751.00	4008.00	8552.00	14778.00	30928.00
CAPACITY=	0.	120.	515.	1091.	1274.	1659.	2596.		

SUMMARY OF PMF AND ONE-HALF PMF FLOOD ROUTING

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 1.00	RATIO 2 .50
HYDROGRAPH AT	10093	.36	1	3021.	1511.
		(.93)		(85.55)(	42.78)(
ROUTED TO	10093	.36	1	2866.	1424.
		(.93)		(81.15)(	40.32)(
HYDROGRAPH AT	10089	1.26	1	9772.	4896.
		(3.26)		(276.72)(	138.63)(
ROUTED TO	10089	1.26	1	8609.	3886.
		(3.26)		(243.76)(	110.03)(
2 COMBINED	10092	1.62	1	11285.	5148.
		(4.20)		(319.55)(	145.77)(
HYDROGRAPH AT	10092	1.67	1	12110.	[illegible]
		(4.33)		(343.18)(	171.6[illegible])(
2 COMBINED	10092	3.29	1	23318.	11072.
		(8.52)		(660.50)(	313.[illegible]2)(
ROUTED TO	10092	3.29	1	21407.	7935.
		(8.52)		(577.72)(	224.[illegible])(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	587.00	587.00	593.00
STORAGE	67.	87.	200.
OUTFLOW	0.	0.	68.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	593.[illegible]	.85	[illegible]	2868.	6.00	16.00	0.00
.5[illegible]	593.[illegible]	.49	211.	1424.	3.25	16.00	0.00

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	596.0	596.00	600.00
STORAGE	69.	69.	139.
OUTFLOW	0.	0.	1301.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	600.74	0.74	299.	8609.	5.92	16.17	0.00
.50	592.63	2.63	217.	3886.	3.17	16.17	0.00

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 4.....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	557.00	557.00	565.00
STORAGE	1001.	1001.	1650.
OUTFLOW	0.	0.	2751.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	566.72	3.00	2110.	22402.	5.[illegible]	16.25	0.00
.50	559.8[illegible]	1.50	1855.	7935.	2.52	16.42	0.00

PERCENT OF PMF FLOOD ROUTING
EQUAL TO SPILLWAY CAPACITY

46

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	10077
ROUTE HYDROGRAPH TO	[illegible]
RUNOFF HYDROGRAPH AT	10079
ROUTE HYDROGRAPH TO	10079
COMBINE [illegible] HYDROGRAPHS AT	10[illegible]
RUNOFF HYDROGRAPH AT	1[illegible]
COMBINE 2 HYDROGRAPHS AT	10092
ROUTE HYDROGRAPH TO	[illegible]
END OF NETWORK	

```
**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********************************

RUN  DATE= 79/08/03.
     TIME= 12.57.35.


                    DAM SAFETY INSPECTION - MISSOURI
                USCH WILDLIFE AREA NO. 3E LAKE DAM (10092)
              PERCENT OF PMF DETERMINATION AND ROUTING

                              JOB SPECIFICATION
        NQ     NHR    NMIN    IDAY     IHR    IMIN   METRC    IPLT    IPRT   NSTAN
       300       0       5       0       0       0       0       0       4       0
                           JOPER     NWT   LROPT   TRACE
                               5       0       0       0

                     MULTI-PLAN ANALYSES TO BE PERFORMED
                          NPLAN= 1 NRTIO= 9 LRTID= 1
      RTIOS=    .28     .29     .30     .31     .32     .33     .34     .35     .36


**********      **********      **********      **********      **********

                          SUB-AREA RUNOFF COMPUTATION

   INPUT PMF INDEX RAINFALL, SCS UNIT HYDROGRAPH PARAMETERS FOR U/S DAM (10093)

                    ISTA.   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                    10093       0       0       0       0       0       1       0       0

                                HYDROGRAPH DATA
      IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNO.   ISAME   LOCAL
          1       2     .36    0.00     .36    1.00   0.000       0       0       0

                                PRECIP DATA
                 SPFE     PMS      R6     R12     R24     R48     R72     R96
                 0.00   25.10  100.00  120.00  130.00    0.00    0.00    0.00

                                LOSS DATA
     LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
         0    0.00    0.00    1.00    0.00    0.00    1.00   -1.00  -94.00    0.00    0.00

      CURVE NO =  -94.00  WETNESS =  -1.00  EFFECT CN =   94.00

                              UNIT HYDROGRAPH DATA
                          TC=  0.00    LAG=    .36

                                RECESSION DATA
                     STRTQ=    0.00    QRCSN=    0.00    RTIOR= 1.00

                              END-OF-PERIOD FLOW
   MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q       MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q
```

SUM 32.63 31.68 .75 88799.
(820.)(810.)(19.)(2514.51)

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THROUGH U/S DAM (10083)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
10083	1	0	0		0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-5897.	-1

STAGE	587.00	589.00	591.00	595.00	595.00	596.00
FLOW	0.00	62.00	65.00	68.00	6791.00	12416.00
CAPACITY=	0.	20.	87.	200.	788.	800.
ELEVATION=	568.	580.	587.	593.	600.	610.

CREL	SPWID	COQW	EXPW	ELEVL	COWL	CAREA	EXPL
587.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
593.0	0.0	0.0	0.

PEAK OUTFLOW IS 187. AT TIME 17.75 HOURS

PEAK OUTFLOW IS 224. AT TIME 17.33 HOURS

PEAK OUTFLOW IS 252. AT TIME 17.08 HOURS

PEAK OUTFLOW IS 284. AT TIME 16.83 HOURS

PEAK OUTFLOW IS 330. AT TIME 16.67 HOURS

PEAK OUTFLOW IS 392. AT TIME 16.50 HOURS

PEAK OUTFLOW IS 464. AT TIME 16.42 HOURS

PEAK OUTFLOW IS 543. AT TIME 16.33 HOURS

PEAK OUTFLOW IS 638. AT TIME 16.33 HOURS

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SUB-AREA RUNOFF COMPUTATION

INPUT PMF INDEX RAINFALL, SCS UNIT HYDROGRAPH PARAMETERS FOR U/S DAM (1008))

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
10089	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	0	1.25	0.00	1.25	1.00	0.000	0	0	0

PRECIP DATA

SPFE	PRS	R6	R12	R24	R48	R72	R96
0.00	25.10	100.00	120.00	130.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-94.00	0.00	0.00

CURVE NO = -94.00 WETNESS = -1.00 EFFECT CN = -94.00

UNIT HYDROGRAPH DATA

TC= 0.00 LAG= .42

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	32.63	31.88	.75	310820.
										(829.)(	810.)(	19.)(	8801.44)

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HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THROUGH U/S DAM (10089)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
10089	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	1	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-596.	-1

STAGE	596.00	598.00	600.00	602.00	604.00	606.00	607.00

FLOW	0.00	653.00	1301.00	2926.00	5991.00	9895.00	14121.00
CAPACITY=	0.	69.	138.	319.	508.		
ELEVATION=	580.	590.	600.	606.	610.		

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
596.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMID
630.0	0.0	0.0	0.

PEAK OUTFLOW IS 1941. AT TIME 16.25 HOURS

PEAK OUTFLOW IS 2019. AT TIME 16.25 HOURS

PEAK OUTFLOW IS 2097. AT TIME 16.25 HOURS

PEAK OUTFLOW IS 2175. AT TIME 16.25 HOURS

PEAK OUTFLOW IS 2251. AT TIME 16.25 HOURS

PEAK OUTFLOW IS 2328. AT TIME 16.25 HOURS

PEAK OUTFLOW IS 2405. AT TIME 16.25 HOURS

PEAK OUTFLOW IS 2482. AT TIME 16.25 HOURS

PEAK OUTFLOW IS 2558. AT TIME 16.25 HOURS

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COMBINE HYDROGRAPHS

COMBINE ROUTED U/S HYDROGRAPHS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
10022	2	0	0	0	0	1	0	0

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INPUT PRF INDEX RAINFALL, SCS UNIT HYDROGRAPH PARAMETERS FOR MAIN DAM (10002)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO

```
10092      0      0      0      0      0      1      0      0

                    HYDROGRAPH DATA
IHYD    IOPT   TAREA   SNAP   TRSDA   TRSPC  RATIO  ISNOW  ISAME  LOCAL
   1       0    1.07   0.00    1.07    1.00  0.000      3      0      0

                    PRECIP DATA
SPFE     PMS      R6     R12     R24     R48     R72     R96
 0.00   25.10  100.00  120.00  120.00    0.00    0.00    0.00

                    LOSS DATA
LROUT   STRKR   DLTKR   RTIOK   ERAIN   STRKS   RTIOS   STRTL   CNSTL   ALSMX   RTIMP
 0.00    1.00    1.00    0.00    0.00    1.00   -1.00  -94.00    0.00    0.00

AVG LOSS =  -94.00  WETLOSS =   -1.00  EFFECTIVE =   94.00

                    UNIT HYDROGRAPH DATA
                 TC=  0.00    LAG=  0.00

                    RECESSION DATA
              STRTQ=    0.00    QRCSN=    0.00    RTIOR= 1.00

                    END-OF-PERIOD FLOW
MO.DA.HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q   MO.DA.HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q

                                                   SUM  32.63  31.68    .75  411902.
                                                        (  829.)(  810.)(   19.)(11663.77)

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                    COMBINE HYDROGRAPHS

COMBINE LOCAL HYDROGRAPHS WITH U/S ROUTED HYDROGRAPHS BEFORE ROUTING

ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
10092       2       0       0       0       0       1       0       0

**********  **********  **********  **********  **********

                    HYDROGRAPH ROUTING

ROUTE COMBINED HYDROGRAPHS THROUGH BUSCH NO. 35 LAKE DAM (10092)

ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
10092       1       0       0       0       0       1       0       0
                    ROUTING DATA
QLOSS   CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
  0.0   0.000    0.00       1       1       0       0               0

NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
    1       0       0   0.000   0.000   0.000  -5576      -1

STAGE   557.00   559.00   560.00   562.00   563.50   564.00   565.00   566.00   566.00

FLOW      0.00   149.00   963.00  1856.00  2751.00  4008.00  8552.00 14278.00 30928.00
```

CAPACITY=	0.	10.	515.	1001.	1274.	1658.	2596.
ELEVATION=	525.	540.	550.	557.	560.	564.	570.

EREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
557.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
563.0	0.0	0.0	0.

PEAK OUTFLOW IS 2353. AT TIME 17.25 HOURS

PEAK OUTFLOW IS 2457. AT TIME 17.33 HOURS

PEAK OUTFLOW IS 2572. AT TIME 17.33 HOURS

PEAK OUTFLOW IS 2685. AT TIME 17.33 HOURS

PEAK OUTFLOW IS 2874. AT TIME 17.25 HOURS

PEAK OUTFLOW IS 3131. AT TIME 17.08 HOURS

PEAK OUTFLOW IS 3359. AT TIME 17.00 HOURS

PEAK OUTFLOW IS 3601. AT TIME 16.92 HOURS

PEAK OUTFLOW IS 3830. AT TIME 16.92 HOURS

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

				RATIOS APPLIED TO FLOWS									
OPERATION	STATION	AREA	PLAN	RATIO 1 .23	RATIO 2 .27	RATIO 3 .30	RATIO 4 .31	RATIO 5 .32	RATIO 6 .33	RATIO 7 .34	RATIO 8 .35	RATIO 9 .36	
HYDROGRAPH AT	10093	.36 (.93)	1	841. (23.75)	875. (24.81)	906. (25.67)	937. (26.52)	967. (27.38)	997. (28.23)	1027. (29.09)	1057. (29.94)	1086. (30.80)	
ROUTED TO	10093	.36 (.93)	1	147. (5.20)	224. (6.33)	252. (7.14)	284. (8.04)	330. (9.35)	392. (11.11)	464. (13.14)	543. (15.38)	608. (17.21)	
HYDROGRAPH AT	10088	1.26 (3.26)	1	2736. (77.48)	2829. (80.25)	2932. (83.02)	3027. (85.79)	3127. (88.55)	3225. (91.32)	3323. (94.09)	3420. (96.85)	3518. (99.62)	
ROUTED TO	10089	1.26 (3.26)	1	1941. (54.95)	2019. (57.16)	2097. (59.37)	2175. (61.58)	2251. (63.76)	2328. (65.93)	2405. (68.10)	2482. (70.27)	2558. (72.43)	
2 COMBINED	10092	1.62 (4.20)	1	2807. (79.43)	2885. (81.64)	2964. (83.87)	3042. (86.09)	3122. (88.37)	3204. (90.69)	3285. (93.00)	3367. (95.32)	3447. (97.59)	
HYDROGRAPH AT	10092	1.67 (4.33)	1	3395. (96.09)	3515. (99.52)	3636. (102.95)	3757. (106.39)	3878. (109.82)	3999. (113.25)	4121. (116.68)	4242. (120.11)	4363. (123.54)	
2 COMBINED	10092	3.29 (8.52)	1	5212. (147.59)	5409. (153.17)	5606. (158.73)	5802. (164.30)	5997. (169.82)	6192. (175.34)	6387. (180.86)	6582. (186.37)	6020. (198.76)	
ROUTED TO	10092	3.29 (8.52)	1	2353. (66.63)	2457. (69.58)	2572. (72.82)	2685. (76.03)	2874. (81.38)	3131. (88.65)	3369. (95.41)	3601. (101.98)	3830. (108.45)	

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	587.00	587.00	593.00
STORAGE	87.	87.	200.
OUTFLOW	0.	0.	6[illegible].

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.28	593.04	.04	201.	187.	1.25	17.75	0.00
.29	593.05	.05	201.	224.	1.67	17.33	0.00
.30	593.05	.05	201.	252.	1.92	17.08	0.00
.31	593.06	.06	202.	284.	2.08	16.83	0.00
.32	593.08	.08	202.	330.	2.25	16.67	0.00
.33	593.10	.10	203.	392.	2.42	16.50	0.00
.34	593.12	.12	203.	464.	2.50	16.42	0.00
.35	593.14	.14	204.	543.	2.58	16.33	0.00
.36	593.16	.16	204.	602.	2.58	16.33	0.00

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	595.00	596.00	600.00
STORAGE	[illegible]	[illegible]	131[illegible]
OUTFLOW	0.	0.	1301.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.2[illegible]	[illegible]3.74	.79	1[illegible]2.	1941.	1.09	16.25	0.00
.29	[illegible]00.58	.68	165.	1919.	1.17	16.25	0.00
.30	[illegible]0.9[illegible]	.7[illegible]	168.	2097.	1.17	16.25	0.00
.31	601.[illegible]	1.[illegible]	170.	2175.	1.25	16.25	0.00
.32	601.17	1.17	173.	2251.	1.42	16.25	0.00
.33	[illegible]1.26	1.25	176.	2324.	1.42	16.25	0.00
.34	[illegible]1.35	1.36	179.	2405.	1.50	16.25	0.00
.35	[illegible]1.45	1.45	182.	2482.	1.58	16.25	0.00
.36	[illegible]1.5[illegible]	1.[illegible]	185.	2[illegible].	1.67	16.25	0.00

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	557.00	557.00	563.00
STORAGE	1001.	1001.	1658.
OUTFLOW	0.	0.	2751.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.28	562.83	0.00	1585.	2353.	0.00	17.25	0.00
.29	563.01	0.00	1604.	2457.	0.00	17.33	0.00
.30	563.20	0.00	1625.	2572.	0.00	17.33	0.00
.31	563.39	0.00	1646.	2685.	0.00	17.33	0.00
.32	563.55	.35	1665.	2874.	.75	17.25	0.00
.33	563.65	.15	1680.	3131.	1.25	17.08	0.00
.34	563.75	.25	1694.	3369.	1.50	17.00	0.00
.35	563.84	.34	1707.	3601.	1.75	16.92	0.00
.36	563.93	.43	1720.	3830.	1.92	16.92	0.00